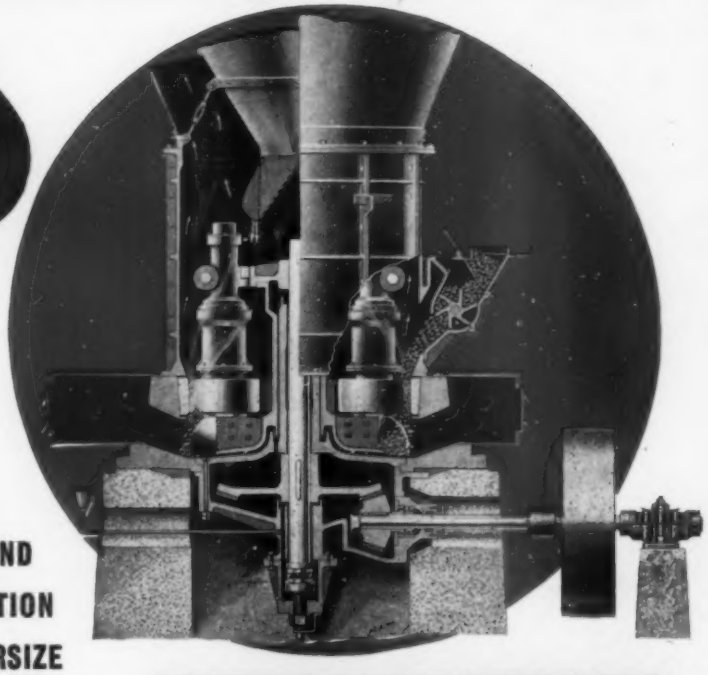
WILLIAMS FINE GRINDING AND AIR SEPARATING EQUIPMENT

Any Fineness from **20 MESH to MICRON SIZES**



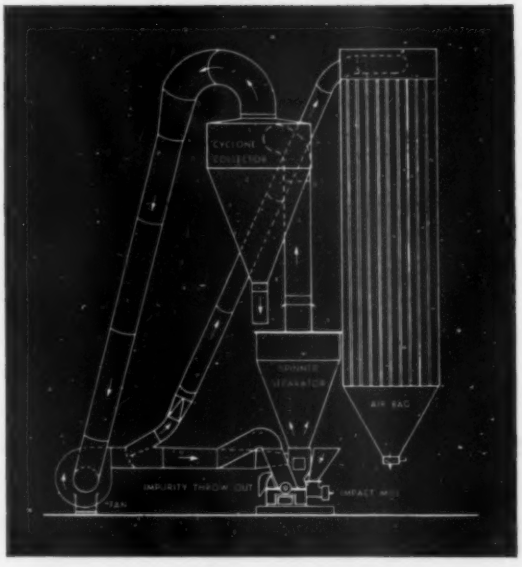
The Williams Roller Mill with Air Separation . . .

- **GREATER GRINDING ECONOMY**
- **POSITIVE CONTROL OF FINENESS**
- **LOWEST HORSEPOWER Per TON GROUND**
- **DRYING and GRINDING IN ONE OPERATION**
- **ACCURATE AIR SEPARATION; NO OVERSIZE**
- **INSTANTLY CHANGEABLE FROM 70%-100 MESH TO 99.9%-325 MESH**

And for Hydrated Lime . . .

The Williams Impact Mill and Air Separator with Impurity Throw-Out

Grinds Hydrated Lime to 400 mesh. Automatic throw-out rejects unburned cores and aids greatly in producing a chemically pure product. The same mill is quickly interchangeable to grind hydrate or burned lime.



The Williams Patent Crusher & Pulverizer Co.
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Williams

PATENT CRUSHERS GRINDERS SHREDDERS

Form 599

Sand Classification

AT LOWEST COST CALLS FOR THE RIGHT EQUIPMENT

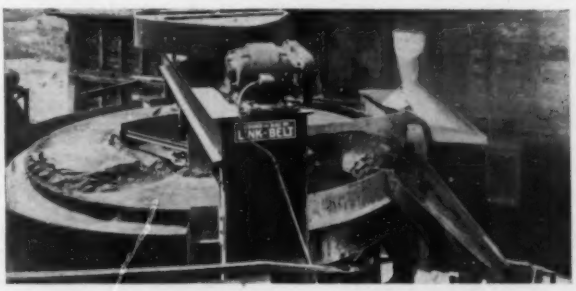
● Link-Belt offers five types of settling and dewatering devices to meet varying conditions found in different pits. These units, described on this page, have been developed and used in many applications to give the required grading, cleansing or dewatering to meet local specifications. Send for special literature.

LINK-BELT COMPANY Chicago Philadelphia Indianapolis Atlanta
San Francisco Toronto Offices in Principal Cities 7339

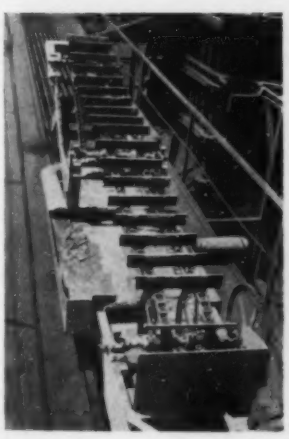
Power Operated Units Produce a DRYER Sand

Many washing plants, particularly those loading trucks, require a sand with a smaller percentage of water than can be obtained with any type of settler having automatic sand discharging mechanism. To meet this need, Link-Belt manufactures the 3 kinds of power operated dewatering devices as shown here.

The Rotoscoop



This unit fills the need for a sand dewatering device that will catch the available sand grains of sufficient fineness to meet present day specifications, and deliver the product dry enough to permit truck transportation, or conveying to and from storage by belt conveyors. It is made in four sizes, 15', 12', 9' and 6' diameters. It consists of a large circular steel tank, together with a rotating disk carrying inclined scoops. Capacities varying from 25 to 150 tons per hour, can be lifted from the large settling area, with the water largely displaced from the voids through a squeezing action peculiar to this device. Because the inlet and discharge are on about the same level, little head room is required. It is entirely self-contained, with motor and driving machinery. A unique feature is that the entire area of the tank is submerged, and utilized for settling purposes. The slow motion of the scoop does not hinder good settling.



Dewatering Flight Conveyor

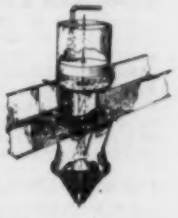
The stream of sand and water is fed into the tank near the center. The settling sand is slowly dragged, by the flights, out of the water, up an incline of proper length, and at a proper speed, to give the drainage required. The dirt and water flow out at the end of the tank opposite the sand discharge. The tank can be made of either steel or wood. By using a fine sand launder and two Dewatering Flight Conveyors, or by arranging two Dewatering Flight Conveyors in series, a coarse and a fine sand can be produced.

Dewatering Screw Conveyor

The screw has a scrubbing action on the sand, and keeps the loam and other foreign matter in suspension, to be carried away in the overflow. Thus a clean and dry sand is secured for use where specifications and inspection are rigid. Also, the screw can be regulated either to reclaim the fine sand, or allow it to pass out at the overflow. By using two units in series, the coarser sands can be reclaimed for concrete sand, and the finer for plaster sand.

Accurate Grading with the SHAW Classifier

This unit will not only produce clean commercial sand but will also make such special grades as asphalt, filter, engine, gypsum and glass sands. It employs a combination of surface current and rising current classification. By using in series, two or more grades of sand can be made at the same time, or mixed into any combination desired. Not only can the sand be graded, but leaves, dirt, etc., can be removed. The dirty wash water is replaced by clean water, so that the small quantity of water which does go with the sand, carries no dirt or silt. Sand graded and cleaned by this unit will meet the most exacting specifications, particularly where removal of fines is important.



Automatic Conical Separator

This less expensive device meets satisfactorily all the requirements in the degree of separation called for by many local specifications. It is reliable—has been proved by satisfactory separation for 23 years or more in many plants throughout the country. Soil water and scoured sand from the screens are delivered into the conical body of the separator. The sand settles to the bottom and gradually accumulates, while the water overflows and runs continuously out of the spill-way, carrying away with it the impurities in suspension. Made in 3 sizes, in capacities up to 2000 gallons of water per minute.

LINK-BELT
· HANDLING ·
PREPARATION
EQUIPMENT

NEXT MONTH'S ISSUE

In the April issue there will appear several outstanding articles on timely subjects. The problem of dust collection in a cement plant also involves the even more difficult problem of handling and re-introduction of the dust into the kiln. These problems were solved by one well-known cement company which also discovered that rock from certain parts of the quarry created more dust in the kilns than other raw material. The second article in the series on cement mill grinding will offer some interesting and practical information on this intriguing subject. One of the most modern reinforced concrete sand and gravel plants will be described.

Dust Collection

This article describes a large dust collecting installation in a cement plant in which the gases from four rotary kilns discharge into a common header from which they pass through four waste-heat boilers and economizers. Each boiler unit has a separate dust collector system. Dust is blended in bins before it is again returned to the kilns. A series of tests were made to accurately determine the quantities and chemical characteristics of the dust.

Reinforced Concrete Plant

Although the sand and gravel plant described does not rank among the big producers, it does offer suggestions for everyone planning to build or modernize. Reinforced concrete was used for bins, columns, and superstructure over the bins. Another interesting feature about this plant is the arrangement made to eliminate vibration by suspending equipment by means of cables.

Elongated Pieces

Nettleton in the next article in the series touches upon a subject which is receiving a great deal of attention; namely, the problem of keeping within the tolerance for elongated pieces. His suggestions as to methods of meeting specifications satisfactorily should be of timely interest.

Chemist Corner

An important investigation has been made into causes of expansion of portland cement samples in the autoclave caused by the addition of magnesia. Particle size and space relationships have an important bearing on the behavior of the test samples.

Granite Crushing

It may be tough to handle, but this redesigned plant is equipped for this very purpose. Practically every production unit has an overcapacity, and connected electric motors are capable of twice the power output actually used. All this was done to cut out overloads and losses in efficiency.

Concrete Products

Diversification is the key to success of large southern concrete products company. While the bulk of the business consists of cinder concrete back-up units, other products sold in quantity include joists, plain and colored floor slabs, roofing tile, septic tanks, brick-faced block, chimney block, concrete silos, bird baths, and benches.

ROCK PRODUCTS

RECOGNIZED THE WORLD OVER AS THE LEADER IN ITS FIELD

With which has been consolidated the journals *Cement and Engineering News* (founded 1896) and *Concrete Products* (established 1918)

VOL. 43, No. 3

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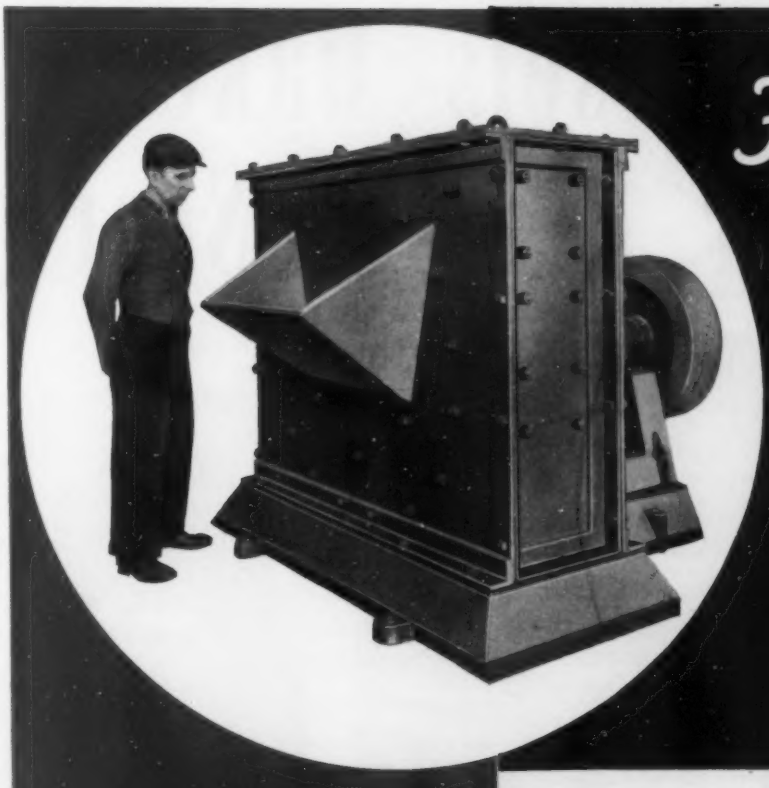

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1. They will produce, thoroughly crushed—cubical shaped particles—free from flats, slivers or splinters.
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In the past 90 days, ten (10) of these machines have been sold for installation in one of the principal gravel producing sections of this country. Capacities of these machines will range from 50 to 225 tons per hour.

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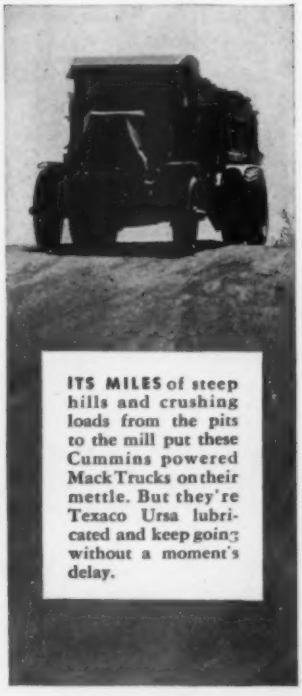

ITS MILES of steep hills and crushing loads from the pits to the mill put these Cummins powered Mack Trucks on their mettle. But they're Texaco Ursa lubricated and keep going without a moment's delay.

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Here's why TIMKEN Removable Rock Bits can drill constant gauge holes *economically*. When the bit begins to get dull—it is removed and a sharp bit of identical gauge is attached to the same steel. Thus, it is necessary to carry only a small steel inventory whereas in the case of forged steel bits the inventory necessary to obtain constant gauge holes is prohibitive.

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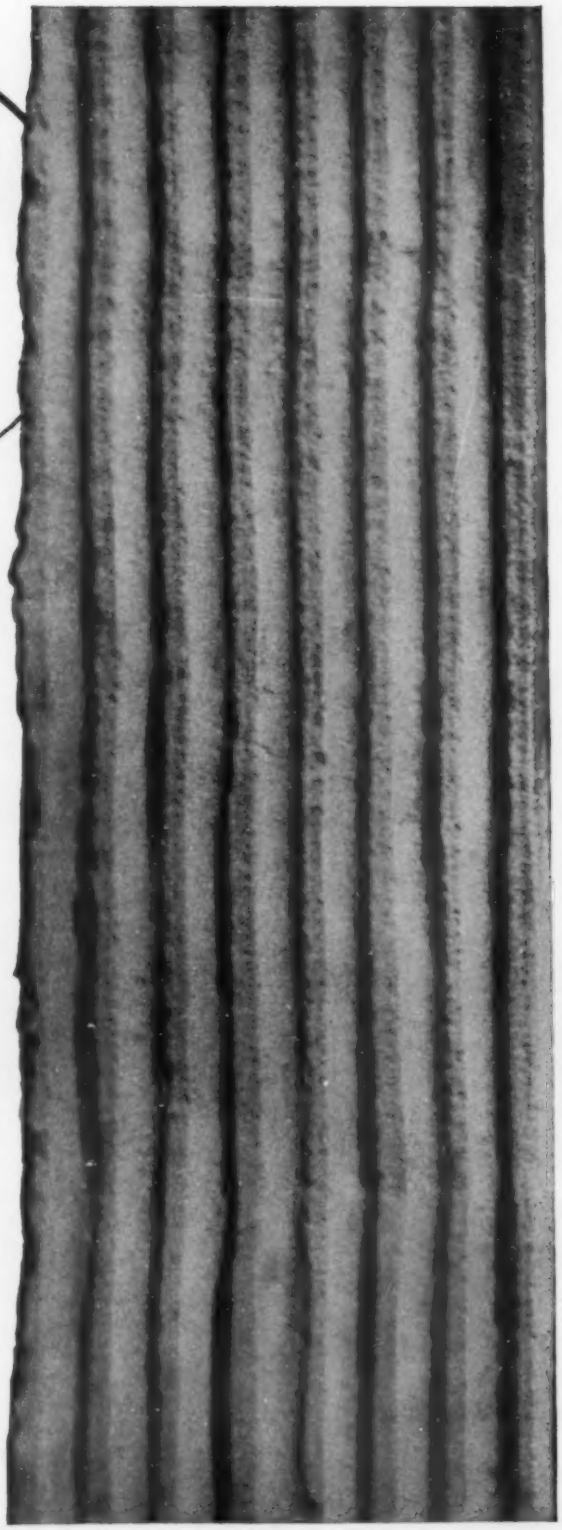

Sample of cores left by drilling constant gauge holes with TIMKEN Bits. Note cores same size from top to bottom thus facilitating broaching.

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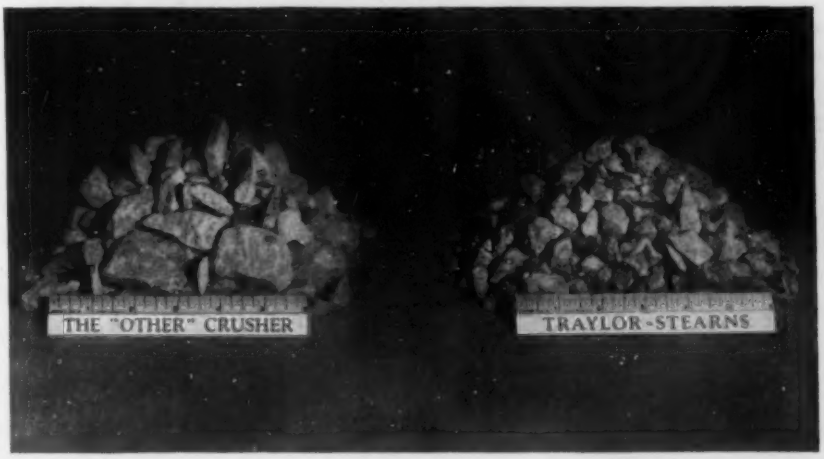

ON THIS SIDE

A 4'-0" Crusher (Not a Traylor)
FEED—Product of a secondary crusher, thru 1⅞", on ⅞"—very slabby.
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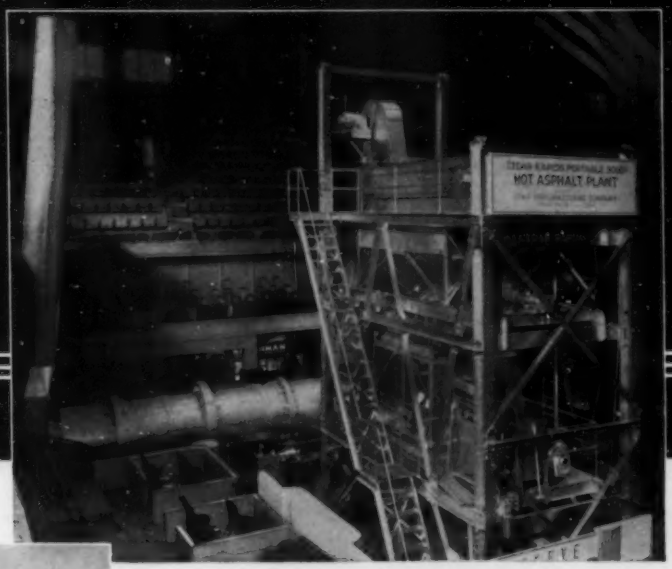

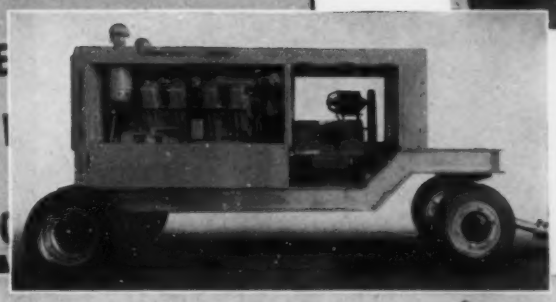

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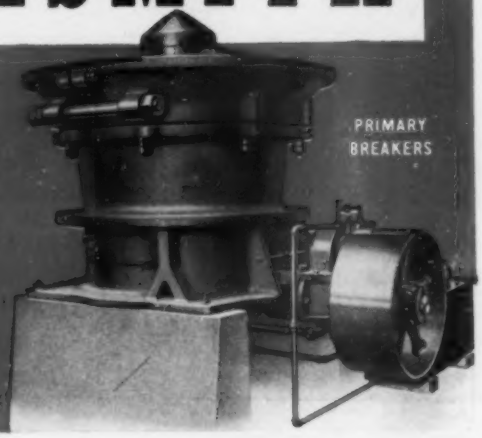

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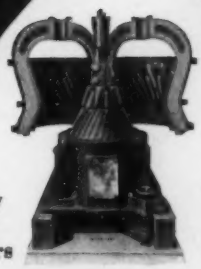
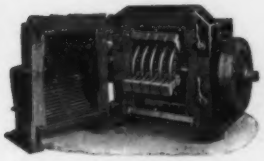
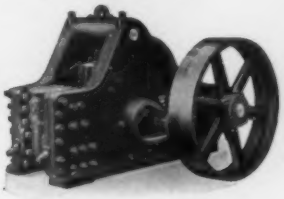


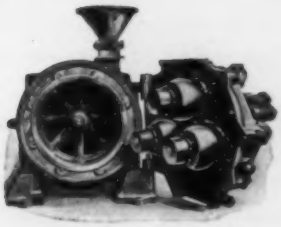
Rotary Fine Crushers



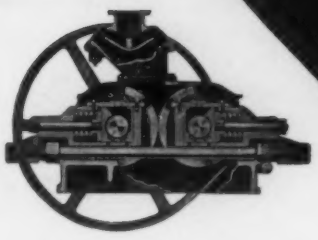
Swing-Sledge Mills



Jaw Crushers



Ring-Roll Mills



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ROTARY FINE CRUSHERS for intermediate and fine reduction (1″ to ¼″). Open door accessibility. Soft or moderately hard materials. Efficient granulators. Excellent preliminary Crushers preceding Pulverizers. Many sizes. Belt or Motor driven.

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JAW CRUSHERS for coarse, intermediate and fine reduction of hard or soft substances. Heavy or light duty. Cam and Roller action. Special crushers for Ferro-alloys. Several types, many sizes.

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PUT THE BRAKES ON HIGH ROPE COSTS!

Lowest general-average rope operating cost is assured through the use of Roebling "Blue Center" Wire Rope. The result of continuous research and development, this rope is the finest product of Roebling's unexcelled research, steel-making and rope-fabricating facilities. Ask about Roebling's "Blue Center" Wire Rope ... either standard or preformed.

JOHN A. ROEBLING'S SONS COMPANY, TRENTON, N. J.
BRANCHES IN PRINCIPAL CITIES

STRONGER—Wire of highest strength consistent with ductility and toughness

TOUGHER—Provides maximum resistance against wear, sudden shocks, vibration

SAFER—Unequalled for uniformity of quality

SAVING—Insures lowest general average operating cost

THE HIGHEST DEVELOPMENT IN ROEBLING WIRE ROPE

Style* for your sand

*THE CORRECT FINENESS MODULUS

Perhaps packaging your sand in cellophane is a bit far-fetched. But it does illustrate a change in style.

Run-of-pit sand is not specification sand any more.

Give your sand the style that counts—not merely washing, but grading to the correct Fineness Modulus. Styling by modern mechanical methods to meet the new and stricter specifications for concrete, silica, asphalt and special purpose sands.

EXAMPLE OF A DORR SYSTEM

Type sand	Asphalt
Capacity	50 tons per hr.
Power	20 H.P.
Water	1000 G.P.M.
Maintenance	½ cent per ton
Cost, erected	$20,000

Perhaps your pit has too much or too little minus 100 mesh. Possibly one part is too rich, another too lean in 28 to 48 mesh fractions.

Regardless of such irregularities, a Dorr Sand Washing System will recut, retailor and refurbish your run-of-pit to standards you want—that your customers want.

★

An inquiry as to "just how" we go about it involves no obligation.

DORRCO

THE DORR COMPANY INC.

ENGINEERS • 570 Lexington Ave., New York

ATLANTA • TORONTO • CHICAGO • DENVER • LOS ANGELES

DORR TECHNICAL SERVICES AND EQUIPMENT ARE AVAILABLE FROM THE FOLLOWING COMPANIES:

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FRANCE: Soc. Dorr-Oliver, Paris
GERMANY: Dorr Gesellschaft, m. b. H. Berlin
ENGLAND: Dorr-Oliver Company Ltd., London
AUSTRALIA: Crossle & Duffy Pty. Ltd., Melbourne
SOUTH AFRICA: Edward L. Bateman Pty. Ltd., Johannesburg
JAPAN: Andrews & George Co. Inc., Tokio
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BUILT FOR ROCK-

Proved in ROCK!

NO Northwest Welded Boom has ever failed! You'll check a long time before you find that statement matched! And behind the Northwest Welded Boom is the Dual Crowd that utilizes crowding force other shovels waste—and behind this is plenty of power.

Cast steel side frames and cast steel bases keep shafts in alignment. Northwest mobility eliminates the delays in relocation. The "feather-touch" Clutch Control makes it easy to nudge the big ones where you want them and full economy and easy maintenance assures the lowest possible operating cost.

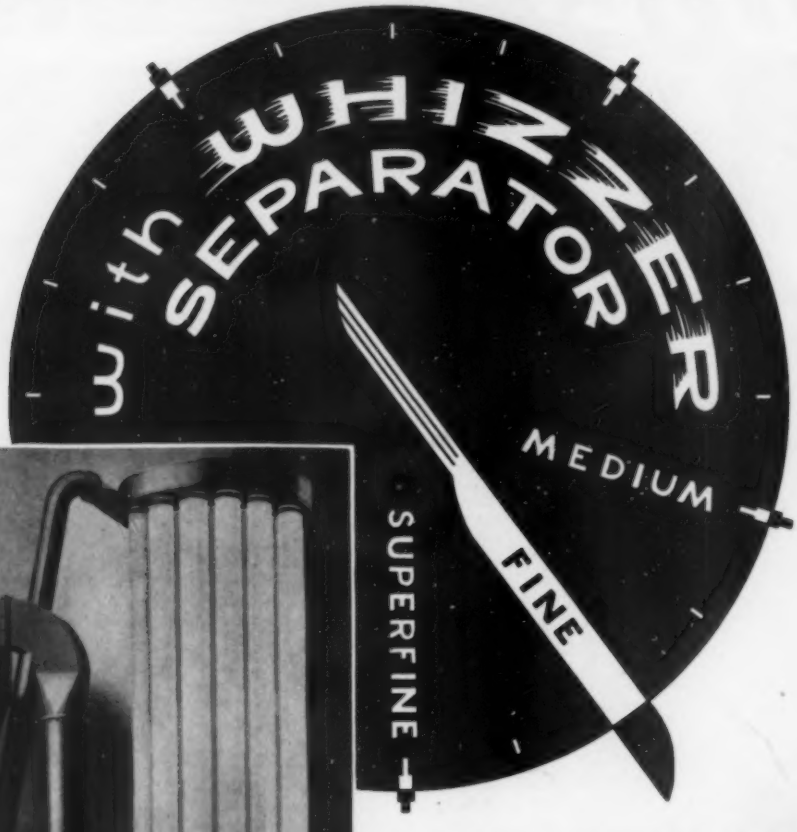
It's a *real* rock shovel and that's why one out of every three Northwests sold is a repeat order. There is a size Northwest for every quarry problem. Let us send you details.

NORTHWEST ENGINEERING CO.
1820 Steger Building
28 East Jackson Boulevard
Chicago, Illinois

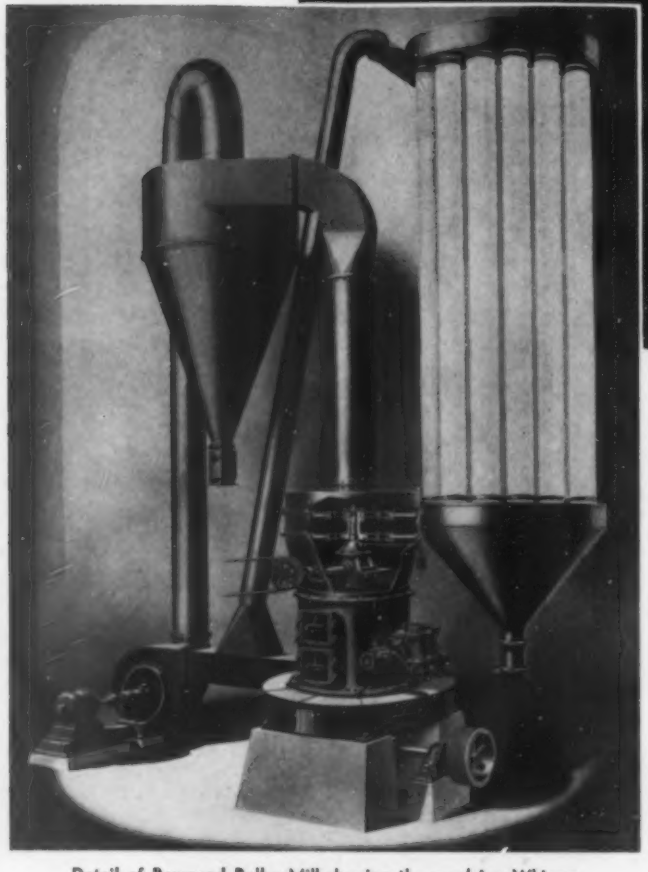
A real Rock shovel means profit in the Pit!

NORTHWEST

Raymond ROLLER MILL • •



SINCE 1887



Detail of Raymond Roller Mill showing the revolving Whizzer mounted in the air separating chamber and driven through the variable speed transmission.

This latest type of Raymond ROLLER MILL may be furnished with either a single or double whizzer, giving any degree of classification up to 99.99% through 400-mesh. By changing the variable speed control, the fineness can be regulated instantly while the mill is running.

The first advantage of the whizzer-type Roller Mill is the uniformity of the finished product. The second is economy of production, due to the high capacity obtainable per horse-power. For example, in grinding chalk whiting, output was increased from 1500 to 4000 lbs. per hour as a result of the whizzer separator. On limestone the increase averaged from 4¾ tons to 6¼ tons per hour, and on phosphate rock, production was raised 35 per cent.

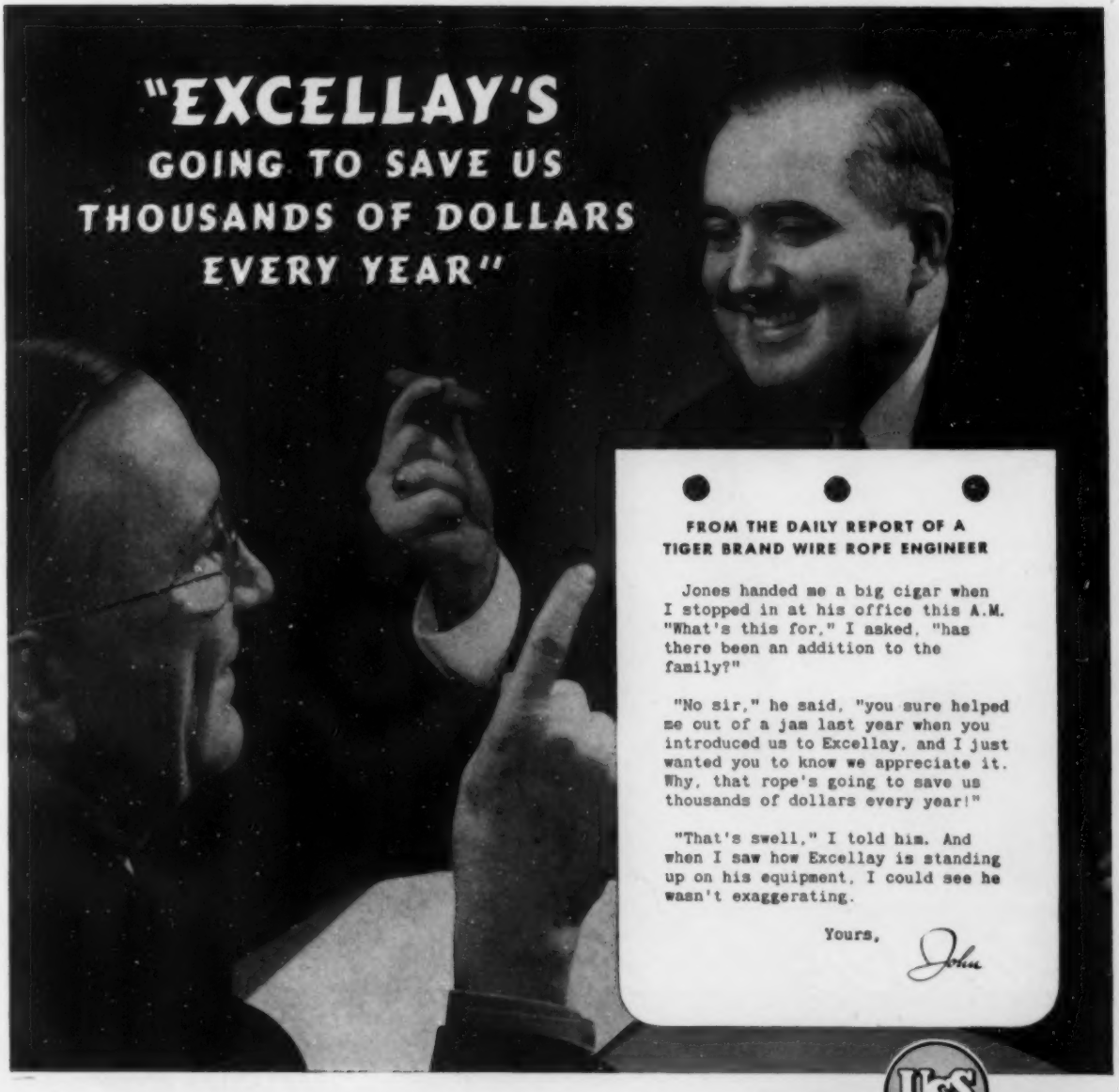
Write for Catalog showing sensational performance of Whizzer-Type Raymond ROLLER MILLS.

RAYMOND PULVERIZER DIVISION

COMBUSTION ENGINEERING COMPANY, INC.

1307 North Branch Street CHICAGO

Sales Offices in Principal Cities • • • In Canada: Combustion Engineering Corporation, Ltd., Montreal



WHEREVER wire rope is used, you can be sure that not far away is one of the arms of the American Steel & Wire Company, the Tiger Brand Wire Rope Engineer.

What these men accomplish is no mystery to the thousands of wire rope users they contact every year. They know your problems, they talk your language. Their job is to help you select the best wire rope for a given task—to help you put wire rope to the most effective use—in short, to help you get a full dollar's worth of performance out of every dollar you invest in wire rope.

Get to know your American Tiger Brand Engineer better. He's in position to give you practical, down-to-earth, money-saving assistance. If for any reason you are not being contacted by one of these engineers, write or call us and you'll learn the true meaning of real wire rope service.

USS

EXCELLAY
Preformed
WIRE ROPE

AMERICAN STEEL & WIRE COMPANY
Cleveland, Chicago and New York

COLUMBIA STEEL COMPANY
San Francisco

United States Steel Export Company, New York

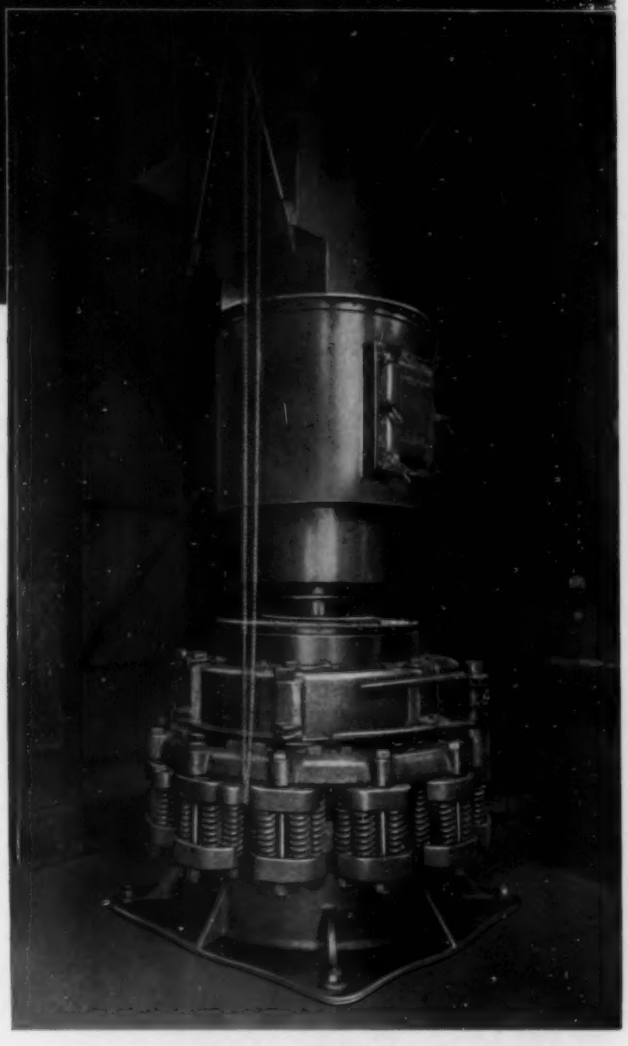
UNITED STATES STEEL


THIS outstanding plant PIT AND QUARRY describes as "unquestionably one of the show places of the sand and gravel industry. The entire plant and all connected operations show the results of careful planning, and it has the neat and attractive appearance which somehow seems to be inseparable from sound engineering".
The B-G Standardized, Sectional Belt Conveyors contributed to this installation in many ways. B-G Pre-Engineered Truss simplified and speeded up the engineering, gave quicker delivery. B-G Standardized Trusses, and completely assembled, factory aligned drives and terminals greatly simplified erection. The B-G Truss required fewer bents, contributing much to the clean appearance. These, and many more Barber-Greene advantages can serve you as well.
40-3
Via Barber-Greenes
. . . at
Missouri-Portland Cement Company
BARBER GREENE
STANDARDIZED MATERIAL HANDLING MACHINES
AURORA ILLINOIS

BETTER CARE PAYS BIG DIVIDENDS

★

Profits are Greater
Service Interruptions
Minimized



Properly installed and cared for machinery always gives better performance than that which was neglected either at the time of installation or later was only given attention after it had ceased to function properly. Well maintained equipment always brings a greater return on the investment and results in more profitable plant operation.

While designed to operate under extremely severe conditions, the Symons Cone Crusher, like any high grade machine, can not be expected to withstand abuse and neglect continually. This applies to practically all equipment used in this same general field and which, when correctly installed and maintained, pays big dividends in more satisfactory service and greater profit returns.

Here is an excellent example of good installation and care of a four foot Short Head Symons Cone Crusher used for making a fine product from an abrasive material which has a tendency to produce considerable dust.

NORDBERG MFG. CO., MILWAUKEE WISCONSIN

New York	Los Angeles	Toronto	London
60 East 42nd St.	Subway Term. Bldg.	Concourse Bldg.	Bush House

SYMONS CONE CRUSHERS

"Phooey," says Riley, "Who Cares How It Looks?"

RILEY is a friend of mine, yes. We bowl a game together now and then, and of a Sunday night we're usually at his house or mine, dunking Lucy's sugar doughnuts into hot coffee and listening to the radio.

But one thing about Riley is he's stubborn like fly-paper. He gets an idea and sticks to it, come rip-saws or rainbows. Although, I got to admit that he knows a good thing when he sees it.

As, for example, Riley is a good customer at my Grease Palace. In fact, that is where we first got acquainted. He comes rollin' in one day in that big truck of his, which is crusted with mud from stem to stern, and battered up like an old tomato can after a back-alley shinny game.

I was just movin' under to give the forward universal a shot of grease, when . . . POW! A hunk of dried-up mud caught me square in the eye, and the first thing I knew I had forgot that Riley was a customer, and was only thinking of him as my friend.

"Where was you brought up?" I hollered. "In a barn yard? Why don't you take a little pride in this truck o' yours?"

I didn't really mean it, of course. I was just annoyed at this hunk of clay, and I was naturally takin' out my spite on Riley. But he was very superior.

"Phooey," he says. "Who cares how it looks? That there truck is made for workin', not just sittin' around lookin' purty."

"Ha!" I says. "That shows how much you know. You'd do a danged sight more payloadin' if people wasn't ashamed to see you pull up in this antique ox-cart of yours! You got to keep up appearances in this day and age, boy, and don't you forget it!"

"Meanin' I should ought to wear my blue serge every day in the week, I suppose," he comes back at me.

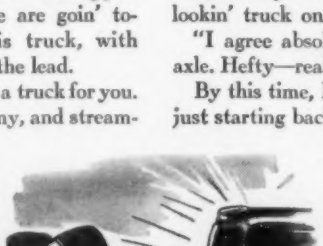
"Meanin' you ought to keep up with the times. Come here."

I took him to the door and pointed at Bert Glover's new Ford Truck which was parked at the curb. "There's what I'm talkin' about," I said.

And the first thing you know, we are goin' toward this truck, with Riley in the lead.

"There you are, there's a truck for you. Bright like a scoured penny, and streamlined like it ought to be."

I turned around to see what kind of reaction I was gettin'. Riley was gone. At least I thought he was, but then he pokes his head out from under a hind wheel.



"You're right," he says, scrambling out and clapping the dust off his hands. "That's just about as good-lookin' a rear axle as ever I see on any truck. Husky. New longitudinal front springs, too, I notice. And a cleaner underside."

"I know that," I says, "I've greased plenty of 'em, and what I mean, they're easy to get at. But it's a *handsome* job, Riley, is what I'm saying—"

"Right again," Riley interrupts, and this time he's lifted up the hood and is lookin' at the engine. "There's a set-up what's *really* beautiful. Look at them eight cylinders. Two banks, four each. Compact. Sweet."

"I been hearin' about these V-type jobs breakin' records in airplanes an' motor boats. They got the stuff."

I am exasperated. "Look at the *outside*," I say. "I'm saying it's a good-lookin' truck on the outside."

"I agree absolutely. Take that front axle. Hefty—really a good-lookin' axle."

By this time, I give up all hope. I am just starting back to the pit to finish up his grease job for him.

"Wait a minute," he says. "I think you've talked yourself out of a job. Just hold up that greasin' till you hear from me." And off he goes in the general direction of the Ford dealer's establishment.

So that's how it is that Riley's driving a Ford these days. But what tickles me is how he takes care of that unit like it was a baby. If I get so much as a little smudge of grease on the fender, he starts braying like a mule, and won't budge till I wipe it off—with a *clean* rag.

The Central Pennsylvania Quarry, Stripping and Construction Company of Hazleton, Pa., are building a 7.27 mile section of the Pennsylvania Turnpike near New Baltimore. The three photographs show work in progress on this big job with a variety of Gulf lubricated equipment.

PEAK EFFICIENCY—LOWER MAINTENANCE

-- and increased yardage

with GULF LUBRICANTS IN SERVICE!

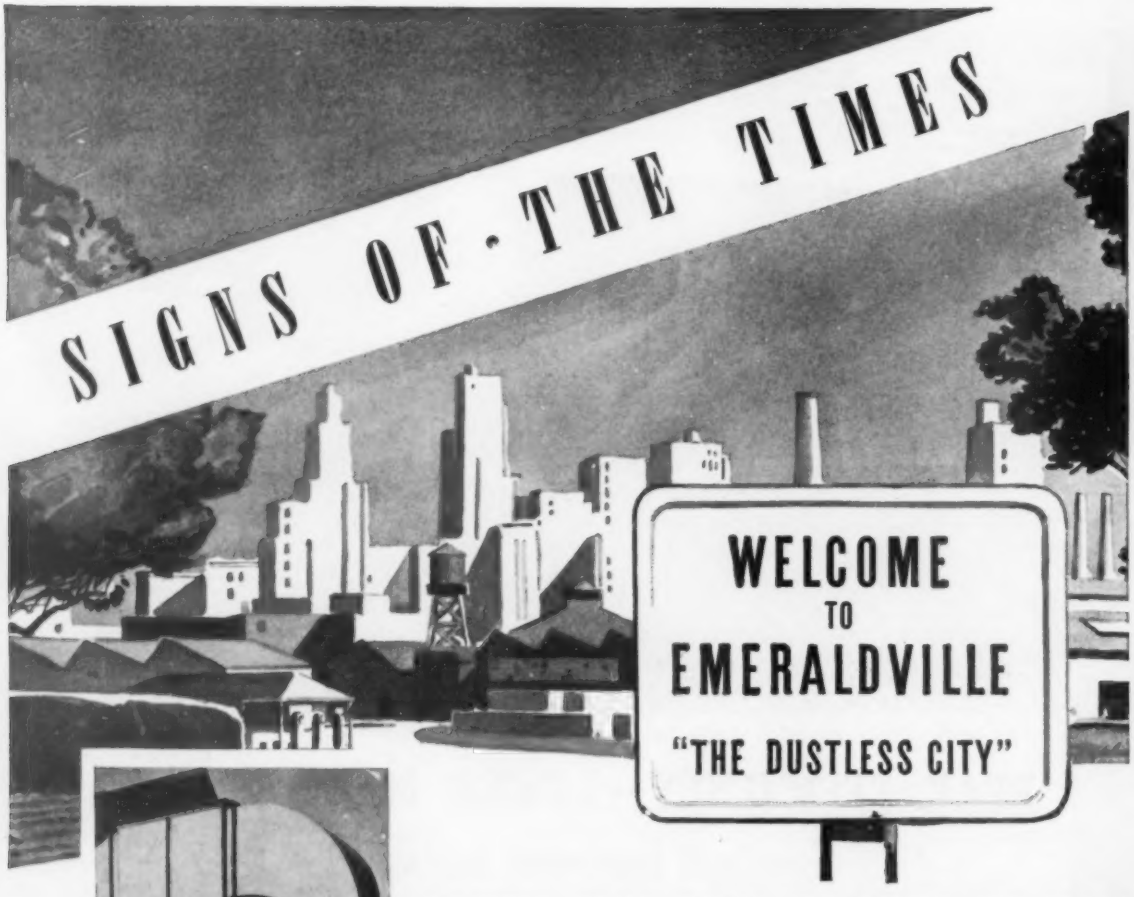
"WE HAVE enjoyed complete freedom from the common run of mechanical troubles on this job with Gulf lubricants and fuels in service," says the Superintendent on this important Turnpike job. "The Gulf engineer has given us recommendations which have been of real assistance."

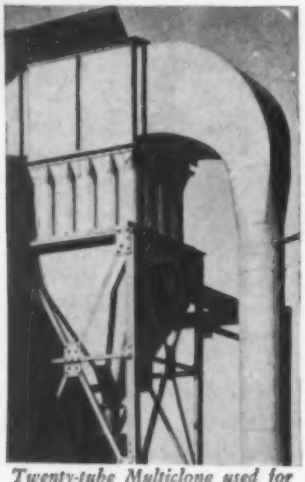
Here's one important reason why so many contractors on the Pennsylvania Turnpike standardized on Gulf quality lubricants and fuels: *they have found that Gulf products are always the same uniform quality and that Gulf service is dependable!* No matter how remote your job, you are assured of a reliable source of supply for quality lubricants and fuels when you get in touch with the Gulf representative in your vicinity.

Take a tip from the big Pennsylvania Turnpike contractors — *use Gulf's higher quality lubricants and fuels.* They are quickly available to you through more than 1100 warehouses located at principal distributing points in 30 states from Maine to Texas.

GULF OIL CORPORATION · GULF REFINING COMPANY

GULF BUILDING, PITTSBURGH, PENNSYLVANIA





Twenty-tube Multiclone used for plant clean-up. High efficiency, low power cost, low draft loss. Compact, all metal, fireproof.

Cottrell Electrical Precipitator recovering cement dust values from kilns and abating a nuisance at the same time.

INDUSTRY CLEANS HOUSE FOR HEALTH AND PROFIT

MODERN factory managers want clean plants. They fight air contamination for moral and monetary reasons—for the elimination of hazards to health and property, and for the recovery of fugitive values in production operations.

• For 34 years Cottrell Electrical Precipitators have been the only universal method for the control—not only of dust—but also of industrial fog, fume and mist. The first installation for the collection of sulphuric acid mist at a smelter is still operating without change. More than 3,000 plants are Cottrell equipped.

• Technical text books give unbiased endorsement to Cottrells for gas cleaning and for the recovery of gold, silver, copper and other elements from refinery fume —for cleaning blast furnace gas—collecting fly ash and cement dust—removing tar, oil and water from manufactured fuel gases—salvaging sodium salts from paper mill black liquor—collecting phosphoric acid, zinc oxide, carbon black and other process powders in the chemical industries.

• Cottrells are available in any capacity from a few hundred c.f.m. to millions. They can be guaranteed to any required efficiency based on total solids or liquids entering the collector, handling hot or cold gases, in wet or dry operation.

• Cottrells have in large measure made possible the slogan: "A Clean Plant is a Sign of Progress."

Write for new brochure giving amazing performance facts about Cottrells in every industry.

WESTERN PRECIPITATION CORPORATION
1016 W. 9th St., Los Angeles • Chrysler Bldg., New York

PRECIPITATION COMPANY OF CANADA, LTD.
Dominion Square Building Montreal, Quebec

PIONEERS IN DUST AND FUME CONTROL

COTTRELL ELECTRICAL PRECIPITATORS **MULTICLONE** MECHANICAL COLLECTORS

A MARION STRIPS TOP SOIL FROM SILICA BED for Standard Silica Corp.

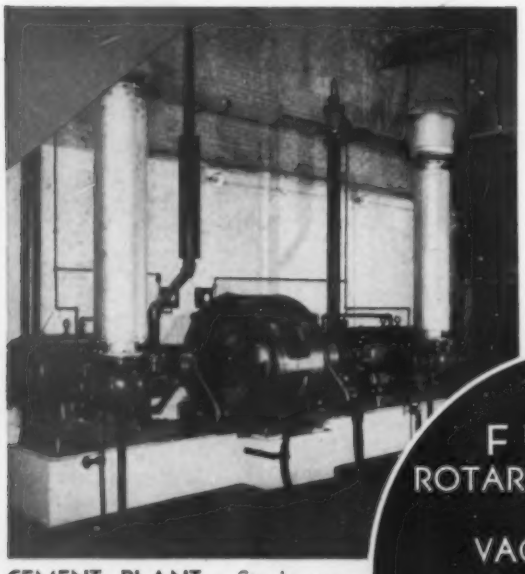
For the purpose of uncovering its silica sand deposits, The Standard Silica Corporation, Ottowa, Illinois, employs a MARION Type 331—3/4 cu. yd. shovel. When it catches up with this job, it is moved here and there over the Standard properties for numerous digging jobs. Exceptional speed, mobility, stamina and low cost operation are accountable for the popularity of this 3/4 cu. yd. MARION. Write for bulletin describing this machine in detail or for other sizes from 1 cu. yd. up. » »

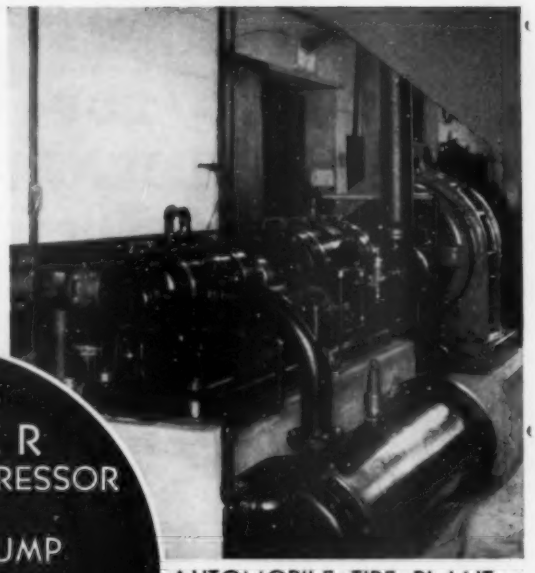
THE MARION STEAM SHOVEL CO.
Marion, Ohio, U. S. A.

MODERNIZE with

MARION

SHOVELS • CLAMSHELLS • DRAGLINES • CRANES • WALKERS



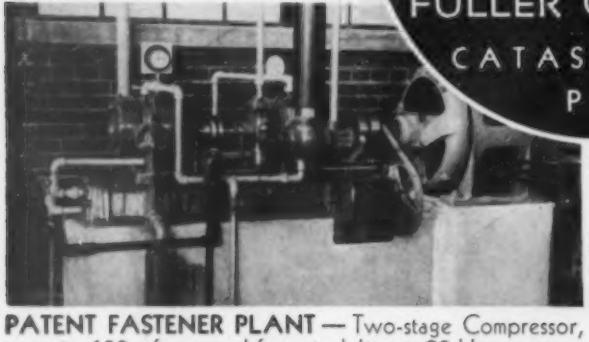


TYPICAL
FULLER
ROTARY COMPRESSOR
AND
VACUUM PUMP
APPLICATIONS

FULLER COMPANY
CATASAUQUA
PA.

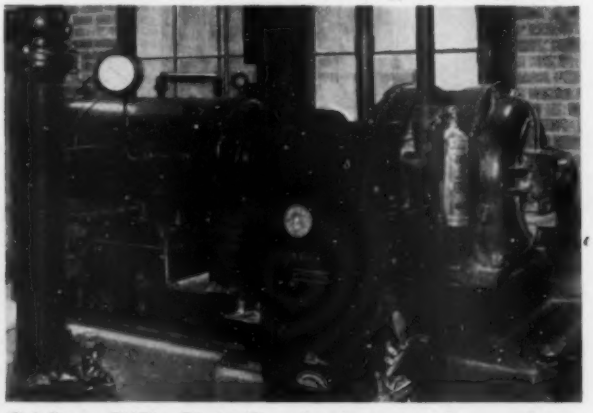
CEMENT PLANT — Single-stage, duplex unit, common motor drive, capacity better than 2200 c.f.m. up to 30 Lb. pressure.

AUTOMOBILE TIRE PLANT — Two-stage Compressor, capacity 388 c.f.m. actual free air delivery, 110 Lb. pressure.



PATENT FASTENER PLANT — Two-stage Compressor, capacity 100 c.f.m. actual free air delivery, 90 Lb. pressure.

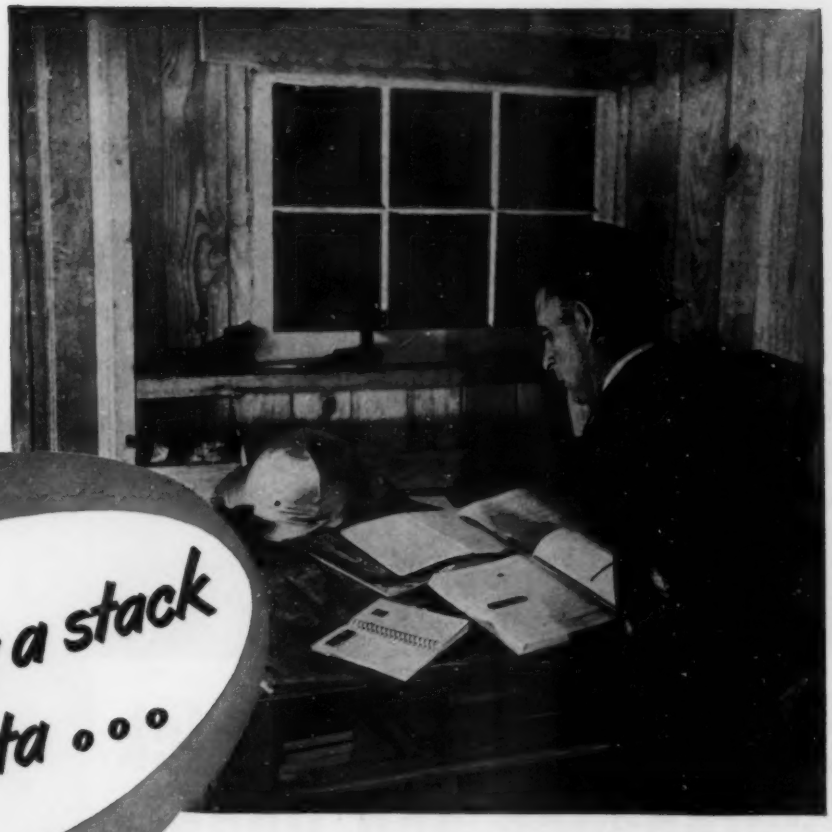
ICE PLANT — Two Single-stage Compressors, capacity each 100 c.f.m. actual free air delivery, 17 Lb. pressure.



GAS & FUEL PLANT — Single-stage, duplex unit, common motor drive, capacity 750 c.f.m. actual free air delivery, 37 Lb. pressure.

GAS & FUEL PLANT — Single-stage Vacuum Pump, capacity 500 c.f.m. at 25 inches of vacuum.

Nine of a shipment of twelve Single-stage compressors installed in United States Post Office Building, Washington, D.C., for use in connection with sewage ejectors. C-38



Stumped by a stack of Rope data . . .

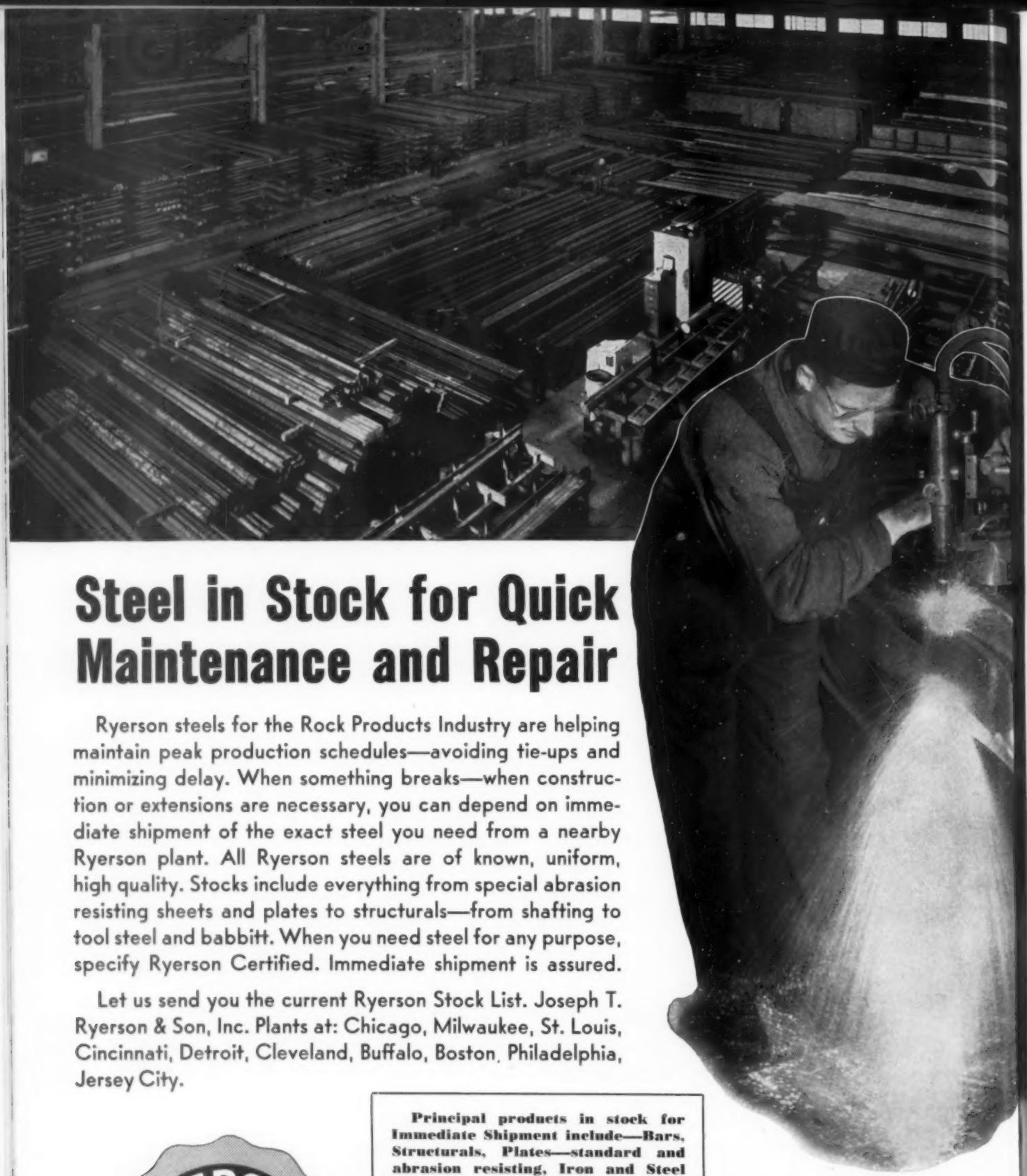
ask your Bethlehem distributor

One of the most important steps in getting maximum life from wire rope is selecting the proper size, grade and construction of rope. With the thousands of different ropes that are made, with the hundreds of different machines using rope, this is not always a simple job.

When you replace your next rope, why not make sure that the new rope is matched to your equipment. A convenient, practical way to do this is to check with your Bethlehem Wire Rope distributor. He knows wire rope. He has mill recommendations for practically every type, make and model of excavating machinery. If some unusual problem is involved, he has only to ask, and a mill-trained engineer will arrive at your job.

This engineering service is one of many reasons why it pays to deal with Bethlehem distributors when buying wire rope. A letter to Bethlehem Steel Co., Bethlehem, Pa., will bring you the names of the nearest distributors of Bethlehem Wire Rope.

BETHLEHEM STEEL COMPANY



Steel in Stock for Quick Maintenance and Repair

Ryerson steels for the Rock Products Industry are helping maintain peak production schedules—avoiding tie-ups and minimizing delay. When something breaks—when construction or extensions are necessary, you can depend on immediate shipment of the exact steel you need from a nearby Ryerson plant. All Ryerson steels are of known, uniform, high quality. Stocks include everything from special abrasion resisting sheets and plates to structurals—from shafting to tool steel and babbitt. When you need steel for any purpose, specify Ryerson Certified. Immediate shipment is assured.

Let us send you the current Ryerson Stock List. Joseph T. Ryerson & Son, Inc. Plants at: Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Buffalo, Boston, Philadelphia, Jersey City.

Principal products in stock for Immediate Shipment include—Bars, Structurals, Plates—standard and abrasion resisting, Iron and Steel Sheets—including roofing and siding, Tubing, Shafting, Strip Steel, Alloy Steels, Tool Steels, Stainless, Babbitt, Welding Rod, etc.

RYERSON CERTIFIED STEELS

Flame cutting, the most intricate parts from heavy plates, is a valuable feature of Ryerson Steel-Service.

RYERSON

ADMINISTRATIVE LAW—

Seasonal Exemption an Example

THE HEAVY calibre guns of the opposition are being concentrated on the New Deal's "administrative laws." A concise definition of an "administrative law" is lacking, but most of us understand it to mean a law that sets up a special bureau or commission to interpret and administer it. A cynical definition might be "a law so loosely and carelessly drawn that even the law makers who voted its adoption are willing to leave its meaning to be determined by 'experts.'" This irresponsible attitude of legislators toward new legislation is the biggest factor in changing our institutions from "a government of laws" to a "government of men."

As the history of this period is written by future historians, probably the thing they will emphasize most is this sudden deluge of new laws designed to change the long-standing habits and customs of the American people and to make-over quickly our venerable institutions. They will contrast this period with those that went before when laws were considered and debated for years before adoption to determine their possible effects.

All this is not helpful or encouraging to American business, constantly worried by bureaucratic administration of "administrative law." The fond hope that the United States courts would eventually come to the rescue has been somewhat dimmed by recent decisions of the Supreme Court, which say in effect: "Don't pass the buck to us; if the laws are loosely and crudely drawn, your remedy lies with Congress which makes them, not with the courts." This raises a howl to the effect that even the courts have sold out to the reformers, but a little reflection shows that this attitude on the part of the courts is the best one for the nation's health, because it hastens return of a sense of responsibility on the part of Congress.

A large part of our rock products industry is much concerned, right now, with one of these administrative laws—the so-called Fair Labor Standards Act (wage and hour law) which attempted in a brief space to legislate for a vast variety of industries in numerous diverse localities under many divergent circumstances. The result, as every business man knows, is great confusion as to the meaning and intent of much of the law. Nevertheless, with care-free abandon, Congress and the President turned over its interpretation and administration to men of no industrial or business experience whatsoever.

Among other things the law provides for exemption of "seasonal" industries from payment to workers of time-and-a-half minimum rates for a period not exceeding 14 weeks. At the time the law was before Congress it appeared to be the accepted version that this exemption was a sop to farmers, designed to keep down the wages of unorganized itinerant agricultural workers both on the farms and in the canning and packing plants, many of which are run by farmer coöperatives. If there is any class of labor outside the big city sweatshops which needs government help to establish a living wage, it is this group.

However, the law provided for exemption of seasonal industries but did not define a seasonal industry. It says, where the administrator of the law finds one he shall exempt it. The administrator thus makes a definition and proceeds to enforce the law accordingly. But in doing so he is writing a new law to rule the aggregates industry. Under certain climatic conditions, half of it is exempt and the other half under the same conditions is not exempt. The sand and gravel industry wins exemption, the crushed stone industry is refused exemption.

We do not believe this decision, this administrative cleavage between the two industries, is anywhere near as important commercially as some producers think. First, not over 25 to 30 percent of these materials move in interstate commerce, and therefore do not come under the law at all; second, apparently about 75 percent of the present business is for federal projects, much of which comes under the Walsh-Healey government contracts law superseding the wage-and-hour law; third, labor union contracts may require time-and-a-half pay, regardless of the seasonal exemption feature of the law.

We believe that the National Sand and Gravel Association presented a sound logical case for the industry, under the law as it is written, and that it well deserved a favorable decision. Our only point is that here is a specific and familiar example of the working of an administrative law—a law which permits a well-meaning but inexperienced young bureaucrat to cleave an industry in two; to hand to one branch a cost advantage that could well nigh be fatal to the other branch, if by any chance a considerable volume of production is actually affected.

Nathan C. Rockwood

Most Needed In Management Is Common Sense

Fred D. Coppock

Says Fred D. Coppock in this guest editorial on opportunities for youth

President, American Aggregates Corp., Greenville, Ohio

I DELAYED answering your letter, hoping that I might be able to conjure up something to say which would be of worth. Invariably, however, I arrive at the same conclusion; i.e., that I have for years been seeking exactly the same information which you have asked for.

I presume that there are few men interested in the gravel business throughout the country who have had occasion to consider the question of plant management as much as we have. Because of having several plants scattered through a few states, this problem has been a big one for us, and I still feel we have not been able to solve it. Therefore, I do not feel competent to properly answer your request.

We have experienced varying results. I note you ask whether or not a man's starting as a laborer would, in our opinion, cut him off from the opportunity of becoming an executive. Your question is somewhat to the contrary of our experience. Most of the problems associated with the production of aggregates are not of such a technical nature that highly educated supervision is essential. A knowledge of mechanical operations, a sympathy for and understanding of labor, an inborn leadership of men, coupled with good common sense, are in my opinion, more immediate requisites for the management of gravel operations than technical training.

Technical men and technical advice can usually be employed—while the qualities which go to make up a plant manager are difficult to find in the single individual. Please understand that I do not mean to say that a college man is not well suited to be a manager. In my opinion he has a decided advantage, provided he is by nature fitted with the other essential qualities. Based on my own experience, I find that few college men are willing to do the things and make the necessary sacrifices in order to acquire a practical training. Too often, college men, as managers, must depend on the judgment, knowledge and honesty of the men under them, and to that extent they are put to a disadvantage. The manager should know from experience what to expect of each man under his direction. He should have some knowledge, from experience, of what to expect from the various mechanical devices used in the operations, and how to arrange and maintain them.

It seems to me that the ideal manager needs to be a man who has come up through both courses of training (production and sales) and through it all has retained his good common sense, a willingness to sacrifice and work, a willingness to contend with the objectionable phases of the gravel business, a sympathy for and understanding of the men under his direction, and a determination to make good.

The broad distribution of gravel and other aggregates deposits, the low value of the finished products and the comparatively high cost of transportation, plus the fact that the finished products can be produced from a plant requiring little money to build, all tend to bring about a highly competitive situation. Only limited areas can be served, therefore strict economies in plant construction and operation must be employed. The gravel business cannot afford fine buildings and clean, pleasant surroundings. The materials handled are dirty, the plants, machinery and most of the premises are dusty, grease-coated and dirty. The work is rough. The men need to be rugged —not afraid of grease and grime and not ashamed of soiled hands and clothes. Most of these conditions are objected to by the highly educated, polished college graduate. It is difficult and often impossible for college or technically-minded men to fit themselves comfortably into such surroundings. Their educational efforts have been for the purpose of avoiding such things.

I am not concerned as much about any problem in our business as I am about its future management. Naturally, I will appreciate a summary of the opinions forwarded to you.

Better Feeding Means Better Screening

Increase the screening efficiency of different types of vibrating screens by improving their feed chutes

By ROYAL E. FOWLE*

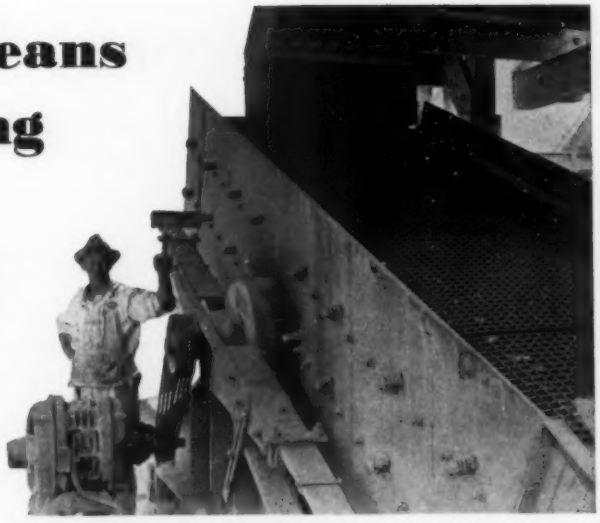


Fig. 1: Feed chute at 5- x 14-ft. Robins 3½ deck sizing screen with pan on bottom, making 4½ decks

DURING THE PAST ten years the writer has studied the methods of feeding material to vibrating screens at various rock, gravel and cement plants, along with the screening efficiency of vibrating screens. These studies, added to our own plant screening experience, have led to the conclusion that many producers do not derive the full screening value which many of their screens are capable of delivering. We all endeavor to use screen cloth having a wire size or gauge that will give minimum blinding, and we also try to use screen cloth having a high percentage of openings so that screening efficiency will be high. At the same time, we balance wear or screen cloth life against the high screening efficiency of the lighter wire. Most plants are using wire sizes that give reasonable wear, along with a total in screen cloth openings that should be adequate for satisfactory screening operations.

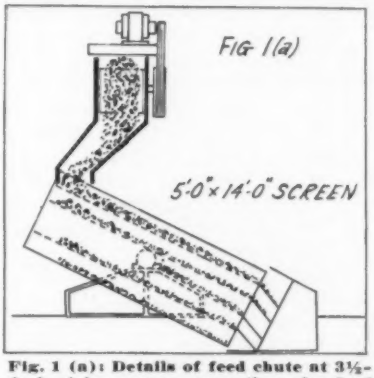


Fig. 1 (a): Details of feed chute at 3½-deck sizing screen, operating ahead of washing screen, Fig. 3

Why then do the sieve analyses of the sized materials from various vibrating screens show such a wide variance in screening efficiency? This efficiency runs from as high as 95 percent to as low as 50 percent.

Some Causes of Low Screening Efficiency

Perhaps the first cause of low screening efficiency is overfeeding, or running to the screen an hourly tonnage of material greater than the manufacturers' recommendations; recommendations that vary widely for a given screening problem. These variations follow closely the effectiveness of the different actions or mechanical means used by the

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Fig. 2: Feed chute at 4- x 10-ft. two-deck sizing screen. Trajectory curve of material from the head pulley was plotted to determine the location for discharge lip and bottom of rock box

Below—Fig. 2 (a): Showing flow of material and chute arrangement in Fig. 2

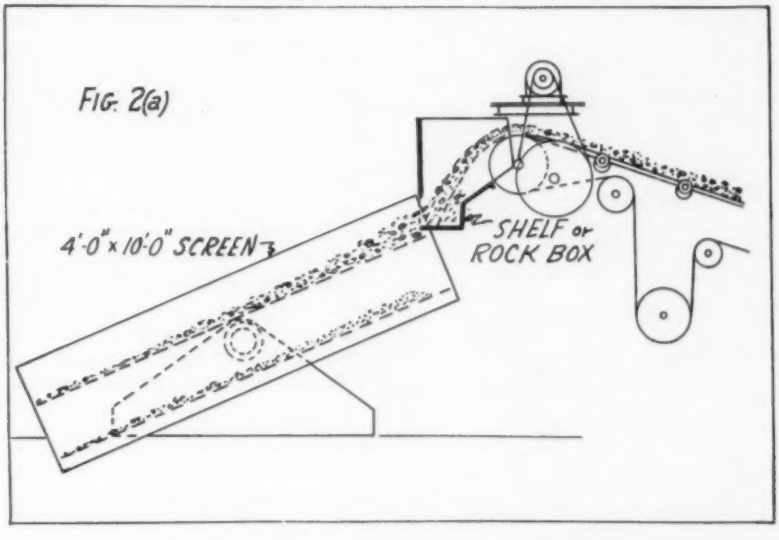


Fig. 3: Left—Sprays applied against aggregate as it passes through chute to 5- x 12-ft. washing screen

Right: Sprays applied over double-deck washing screen

manufacturers to impart a screening motion to the screen cloth. Some have their tonnage recommendations too high, particularly for crushed materials; also, there are surges in some screening operations that put the load higher than the hourly rate, but the majority of screen manufacturers take care of these surges by making conservative tonnage recommendations.

Let us consider any one of the better known successful screens, in good operating condition, and having a tonnage feed which follows the screen manufacturer's conservative recommendation. Let us also assume that the screen cloth openings, wire size, and crimp are such as to lend themselves to highly effective screening. We would expect material from such a screen to have an analysis that would show close screening or little carry-over, but too frequently this is not the case. The fault often lies in the method of placing or feeding the material on the head end of the screen whereby only a part of the screen cloth area is utilized. Again, at times the material goes over the upper one-third to one-quarter portion of the screen cloth at such a high rate of speed that it cannot be screened effectively; effective screening taking place only after the particles have slowed down to normal screening speed.

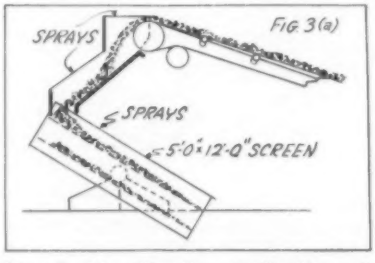
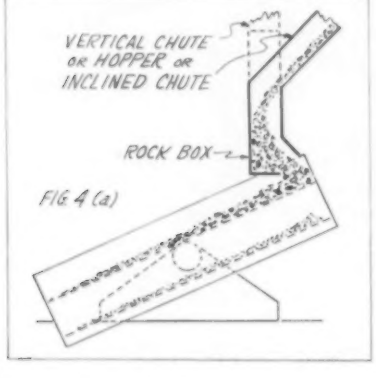


Fig. 3 (a): Showing application of sprays in feeder and over screen



Methods Used to Retard and Spread Material

Many ingenious as well as makeshift devices are often used to slow down the speed of material over the screen cloth and also to spread it so as to use more of the available screen cloth area. Some of these devices consist of a piece of conveyor belt or a steel plate or a hinged counterweighted steel plate, hung over a discharge chute and at times nearly touching the screen cloth; tending by impact and drag action to slow down and spread the material. In addition to these, bent deflector plates are used, or angle iron jumps are spaced at intervals completely across the screen cloth surface. Angle irons are at times placed at intervals, but only half way across the screen cloth surface and staggered along its length to serve a like purpose. As shown in Fig. 3, water sprays shot against the flow of material aid in directing its travel in chutes so that material will feed at the correct point on the head of the screen. Sprays applied against the aggregate as it passes through a chute or over the screen cloth can serve to slow down and spread the material as well as wash it.

Fig. 4: Right, material fed to the rear from rock box at bottom of hopper over 4- x 6½-ft. Robins two-deck screen

Fig. 4 (a): Left, sketch showing flow of material in Fig. 4

Correct and Incorrect Screen Feeding

In the final analysis, all of these methods are used for two purposes: that of retarding the flow of material so that it can more readily pass through the screen cloth openings, and that of spreading this material over a greater part of the available screen cloth area. Both of these can be accomplished through correct screen feeding.

At times producers have had close clearance conditions and difficult installations to overcome and have faced real problems in screen feeding; problems where the ideal feed chute arrangement could not be installed. The writer has collected a large number of screen and screen-

ing photographs showing some of the incorrect or less efficient methods of delivering and feeding materials to vibrating screens. These photographs show materials being carried to the screens by belt conveyors, pan feeders, bucket elevators, chutes, etc., or dropped direct from gate openings onto the screen cloth. In some of the "incorrect way" cases as little as one-third of the cloth area is being used, due to heavy loadings passing over the cloth at too high a rate of speed. Some of the photographs showing both ways were received from screen manufacturers, or taken from their catalogs. The "incorrect way" photographs are not included as the screens can be readily recognized and might give a reader an impression that the manufacturers do not know how to feed their own screens, or that they do not give their customers enough information to enable them properly to design feed chutes or to feed their screens correctly. It is the writer's belief that in the past some screen manufacturers have been quite lax in supplying screen purchasers with full screen feeding information. However, most of the manufacturers are now making a real effort to assist the purchaser, not only in setting up the screens correctly, but also in instructing the purchaser in correct feeding to get the highest screening efficiency with their equipment.

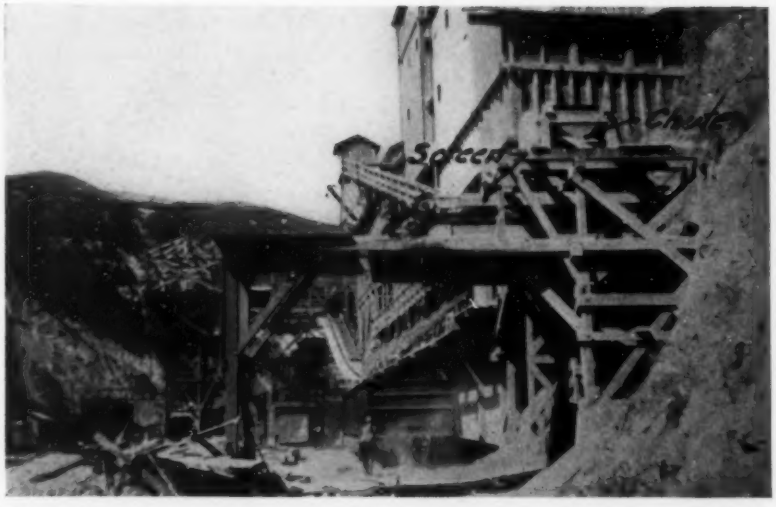


Fig. 6: Arrangement of 4- x 10-ft. Symons dry material car loading screen. In the background is a construction view of new washed material car loading plant

Let us consider some of the methods by which material is transported to a vibrating screen, together with the direction from which the screen is fed in relation to its cloth surface and its longitudinal center line.

Methods of Carrying Material to Screen

In case "A", we have the horizontal or the 18 deg. belt conveyor with its average speed of about 300 ft. per minute and feeding at any angle with the screen's longitudinal center line and discharging at the head of the screen. The average vibrating screen picks up and moves its material at about one foot per second, or 60 ft per minute, so we must slow this material down, at times with a minimum of breakage, to about one-fifth of its original speed Perhaps the best velocity at which to "land" material on the head end of a vibrating screen is at zero velocity toward the discharge end of the screen. This statement may seem misleading at first glance, but if the feed to a horizontal or inclined vibrating screen comes in from the opposite direction, or counterflow to, the material going over the screen, then it must stop for an instant before it reverses its direction of flow to go over the screen cloth, just as the pendulum of a clock must reach zero velocity at the end of its swing.

The first requirement for better screening, that of retarding the material so that it can more readily pass through the screen openings; and the second requirement, that of utilizing the full screen area, are solved by correct chute arrangements. Chute arrangements as shown in drawings Figs. 1 (a), 2 (a), 3 (a),

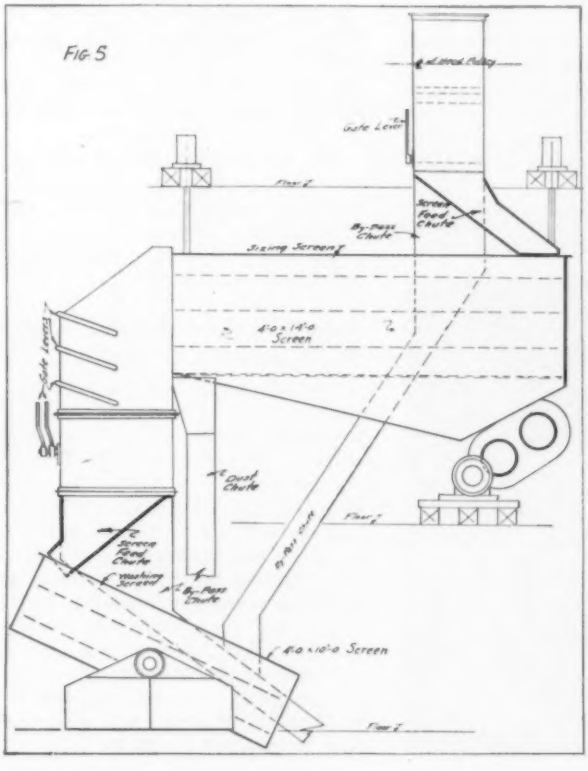


Fig. 5: From drawings of a proposed resizing and washing screen arrangement

Fig. 6 (a): Relative position of chute and screen in Fig. 6

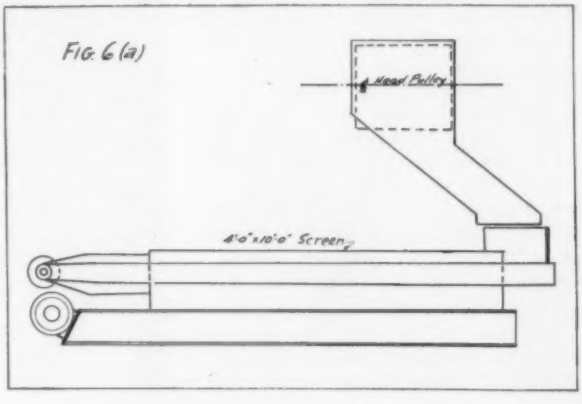


Fig. 8: Feed chute serving 4- x 6-ft. Niagara two-deck screen located directly under 60-in. diameter revolving screen

4 (a), 5 and 6 (a), with the corresponding actual installations. Figs. 1, 2, 3, 4 and 6, are suitable for use with belt conveyors, as such chute installations tend to slow down and spread the material to be screened. This results not only in better screening, but also lessens the wear on the screen cloth. The chute arrangement as shown in Figs. 2 and 2 (a) has handled 8-in. rock. It is believed that the other feed chutes shown would handle 3½-in. rock or larger.

In case "B", we have the bucket type inclined or vertical elevator, discharging at the head of, and usually on the center line of the screen. However, an installation may be such as to make it necessary to bring the chute in from the side or at any other angle to the screen center line. The chute arrangement, as shown in Fig. 4 (a), meets the requirements for better screening as it also slows down and spreads the material to be screened.

The Long Carrying Chute

In case "C", we have the chute that carries material from a screen, belt conveyor, pan feeder, bunker, hopper, gate opening, or other source. These chutes are at times fairly long and deliver the fast moving material at any angle to the screen's longitudinal center line; i.e., from any point of the compass. Feed chute arrangements as shown in Figs. 1 (a), 3 (a), 4 (a), 5 and 6 (a), meet the requirements as they also slow down and spread the material to be screened.

In case "D", we have the vertical chute or hopper feeding straight down to the head of the screen. The vertical chute arrangement as shown in Fig. 4 (a) with its shelf or rock box, meets the requirements of slowing down and spreading the material.

Fig. 4 shows a sloping sided hopper installed directly under a screen which is set at right angles to the screen shown in the photograph. A shelf or rock box as shown in Fig. 4(a) is used successfully on the bottom of this hopper.

Vibrating Screen Feed Boxes

The screen shown in Fig. 6 (a) and Fig. 6 simplifies feeding because of its vibrating rock box or hopper. It is only necessary to land the material in the box, the feed from which is controlled by removing or adjusting the front plate. It is believed entirely possible to construct a vibrating feed hopper directly to, or working from, the inclined type of vibrating screen.

Fig. 7: Feed chute for 4- x 8-ft. Niagara two-deck screen with material fed from bucket type elevator behind chute

Figs. 1, 2, 3, 4, and 6 cover some installations at the Granite Rock Co. plant at Logan, Calif. Figs. 1 (a), 2 (a), 3 (a), 4 (a), and 6 (a), show the path or flow of the material for these installations while Fig. 5 is from the plans of a proposed plant installation now abandoned because of other plant changes. Figs. 7 and 8 are also of Granite Rock Co. equipment.

These photographs and the sketches of the flow of material, or any of their combinations, cannot give all of the possible chute or feed arrangements that could be used. However, any arrangements or methods that follow good plant practice and which spread the material on the screen cloth, as well as retard its speed, will result in better feeding, and *better feeding means better screening*.

Industrial Sand Standards

STANTON WALKER, consulting engineer, National Industrial Sand Association, in a recent bulletin advised that as a result of the activities of the Foundry Sand Committee, the American Foundrymen's Association has deleted certain requirements as to tolerance for sand grading recommended in the A.F.A. book on "Testing and Grading Foundry Sands and Clays." Preliminary tests showed that there were wide variations in the sieve analysis of identical samples and that more tolerance should be granted in specifications.

Mr. Walker also referred to activities leading to the development of a standard "referee" method for chemical analysis of glass sand by a committee of the American Society for Testing Materials.

A.S.T.M. Standards Book On Minerals Is Out

ANNOUNCEMENT has been made by the American Society for Testing Materials, Philadelphia, Penn., that its three books on standards for 1939 are now ready for distribution. The book, Part II, Nonmetallic Materials —Constructional, is of particular interest to our industries as it covers the following subjects: Cementitious materials, concrete, masonry building units, road materials, waterproofing materials, soils, and general testing methods. Supplements of any of the parts may be obtained for $3.00, cloth binding. Any one part may be obtained for $8.00.

How to Improve Grinding

First of a series of three articles covering an investigation of grinding installations. Grindability of raw materials and clinkers is the subject of the first article

***By C. D. RUGEN, J. A. KIVERT, and R. E. BOEHLER**

USERS OF PORTLAND CEMENT are working today with a product far superior to that available 10 to 15 years ago. More improvement has been made from a quality standpoint during this time than during any period in the history of cement manufacture. Among other things, finer grinding of raw materials and cement clinker, brought about to a large extent by higher strength demands at early periods, has contributed to this condition.

Grinding mills in use in some plants have been in service for a good many years, while in other plants more modern types of mills and circuits have been installed. The mill operator in either case is faced with the necessity of maintaining methods of operation which will meet present day fineness requirements, and at the same time result in reasonable efficiencies. It is in this direction that a careful study of grinding operations augmented by desirable experimental work will invariably pay dividends.

Fundamentally, it may be said that there have been no revolutionary changes in the basic principles of fine grinding mills since the early development of ball and tube milling. Modifications in size and shape of mills, better selection in the loading and sizing of grinding media and the application of closed circuit systems constitute the principal developments that have been made in fine grinding equipment.

To illustrate the trend toward finer grinding in the cement industry, the graph Fig. 1 shows average 200-mesh fineness of standard cement for the past 15 years at a typical open circuit plant. Although the specific surface determination had not been developed in 1924, it is probable that the cement of 82 percent through 200-mesh was ground to a specific surface of about 1200 sq. cm. per gram compared with about 1800 sq. cm. per gram at the present. This indicates that approximately 50 percent more work is done today in grinding normal cement than 15 years ago.

* Engineering Department, Universal Atlas Cement Co., New York, N. Y.

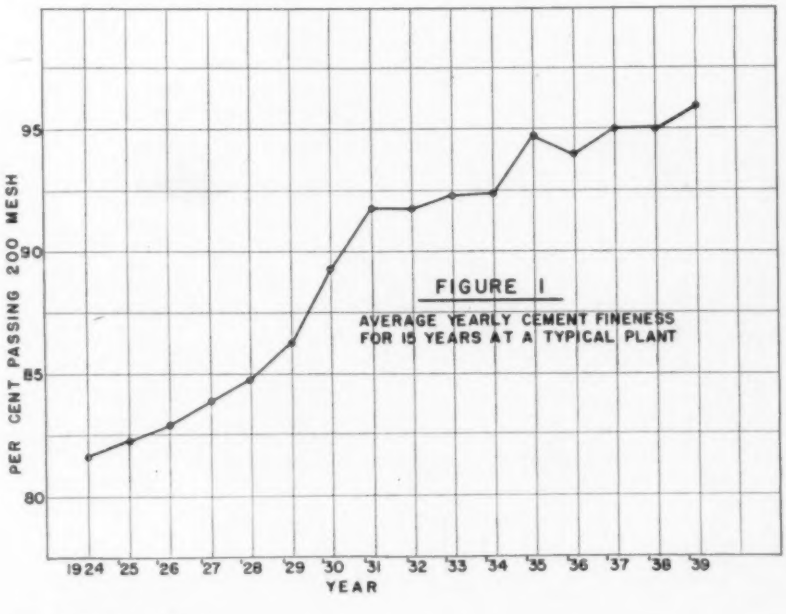


FIGURE 1
AVERAGE YEARLY CEMENT FINENESS FOR 15 YEARS AT A TYPICAL PLANT

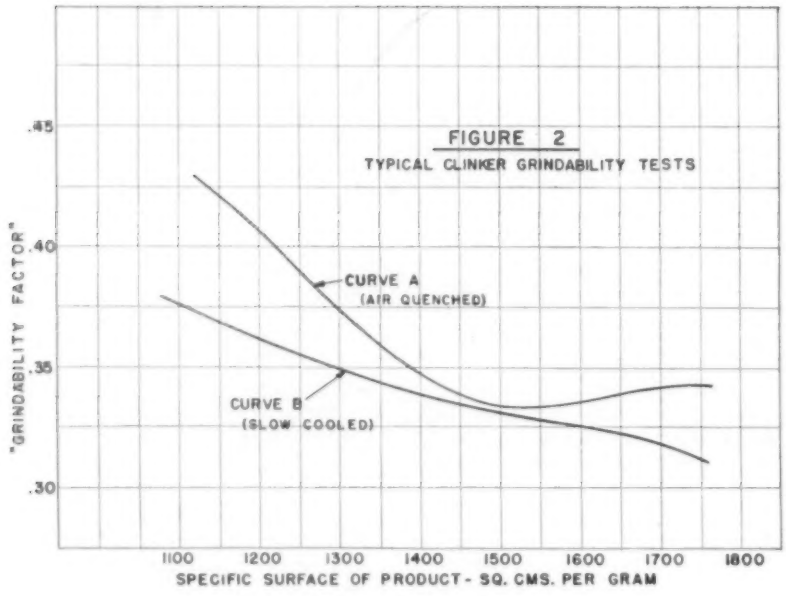
The demand for special more finely ground and high-early strength cements requires still finer grinding. This trend indicates the need for continual improvement in the art of grinding.

An experimental investigation of a grinding operation may be made for the primary purpose of improving mill output or increasing overall efficiency, or it may be undertaken in connection with some specific difficulty or special requirement. Each problem calls for its own method of attack. General rules or grinding "fundamentals" when applied should be used cautiously and substantiated by actual results from the mills in question. This article is an attempt to review briefly some of the factors affecting the operation of grinding circuits and to indicate some of the methods which have been used successfully to improve their performance. Most of the discussion pertains to clinker grinding, but in general is equally applicable to dry grinding of raw materials.

Grindability of Raw Materials and Clinkers

An investigation of the work being done in any industrial operation should begin with a study of the material being worked on. In grinding, too little consideration may be given to the characteristics of the material fed to the mills. Rock, as delivered from quarries, will have varying degrees of hardness and/or chemical and physical structure. Materials may be of the same chemical composition, yet have varying resistances to fracture. Where several strata of rock are used in making up the same mix, and/or varying proportions of other materials are required, a change in mill performance may indicate variable grindabilities.

Portland cement clinker at the average plant will vary more in grindability than will the average raw mix, due to many factors, among which are fineness and composition of kiln feed, degree of burning, method of cooling, type of handling in storage, and age before grinding.



Grindability is frequently misunderstood because it is difficult to evaluate quantitatively. In most cases, the quantity and rate of feed to the grinding mills, the power consumption of the units, and the specific surface of feed and product can be determined fairly accurately. This information furnishes the necessary data to compute the performance of a system. However, to compare one grinding operation with another, it is important to know something about the relative grindability of the feeds to the operations compared.

Several grindability tests have been developed, but frequently these tests fail as accurate measurements of the relative grinding resistance of cement clinkers. Most of the accepted tests are based on the assumption that the sample of material tested has a constant resistance to size reduction and hence can be assigned a definite grindability, irrespective of the fineness or specific surface to which the material is ground.

Rittinger's law states that the work done in grinding is proportional to the area of the new surface produced. Grindability values to be construed as measurements of this work therefore should be based on the increase in specific surface during the test grind. Cement particles lie largely in that range of sub-sieve sizes which cannot be analyzed by fineness tests with the finest standard sieves. Hence grindability values based on 200 or 325-mesh fineness alone should only be used to indicate the relative ease of reducing the materials to pass these particular sieve sizes. Many tests have shown that there is no definite relationship between specific surface of cement and 200 or 325-mesh fineness.

In an attempt to obtain a measure of relative grindability in terms of surface development per unit of energy input at various product specific surfaces, the following test procedure has been devised. A simple batch tube mill of laboratory size is charged a definite weight of sized steel balls and rotated at approximately 78 percent of theoretical "critical speed." Feed to the mill consists of a definite weight of material previously screened and crushed to pass the 20-mesh sieve. Samples of mill feed, and product taken at numerous definite intervals throughout the duration of the grind are analyzed for specific surface. "Grindability factors" for each of the samples are computed by dividing the sq. cm. per gram of surface developed by the number of mill revolutions required for such development. In other words, each factor represents the average sq. cm. per gram developed per mill revolution from the start of the grind to the time of sampling.

Similar "Grindability factors" can be determined on the basis of sieve fineness by dividing the increase in the percentage of material passing a given mesh sieve by the corresponding number of mill revolutions. Such factors are applicable when testing raw material grindabilities since in this case the resistance to particle size reduction down to 325-mesh is all that is required. Factors obtained by either method are not interchangeable, since each represents a different grindability concept.

Fig. 2 is a typical graph showing the relationship of "Grindability factor" (surface basis) to product specific surface for two clinker samples having different cooling treatments. If the two samples had the same relative grindabilities at all end points of specific surface, the curves shown would be parallel. Note that comparisons of relative grindabilities at 1500 sq. cm. per gram and at 1750 sq. cm. per gram are quite different. Uniformly sloped and parallel curves are seldom obtained from relative grindability tests of different cement raw material and clinker samples, which leads to the conclusion that grindability varies with and should be associated either with sieve fineness or specific surface

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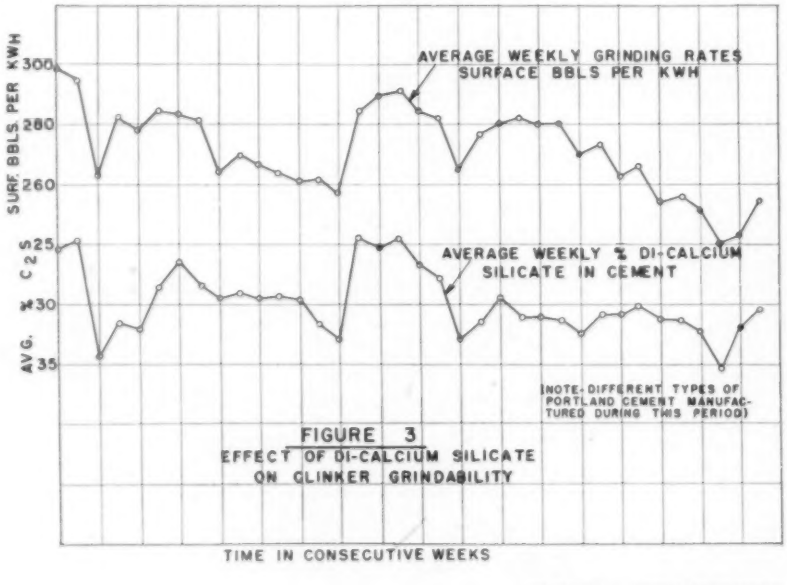


Make Stone Sand A New Way

Plant designed to produce stone sand which meets rigid specifications of Pennsylvania state highway department

By BROR NORDBERG

General view of plant; on left is secondary crusher building and on right is screening plant in which sand classification equipment is located

APPROXIMATELY 13,000 tons of stone sand were used during the 1939 construction season as the fine aggregate in the construction of a concrete highway, U. S. Route 422, in Butler County, Pennsylvania, under the supervision of the Department of Highways, Commonwealth of Pennsylvania. Crushed limestone was used as the coarse aggregate in this work. This was the first project in which stone sand was used as the fine aggregate in Pennsylvania with the exception of an experimental road built on Route 30, in Wormleysburg Boro, Cumberland County, Penn., in 1937.

Stone sand, specified as an alternate to natural sand on the Butler county project, was furnished by the Annandale, Penn., plant of Pittsburgh Limestone Corp., a U. S. Steel subsidiary. Mechanical analysis for type A stone sand, specified and furnished, is as follows:

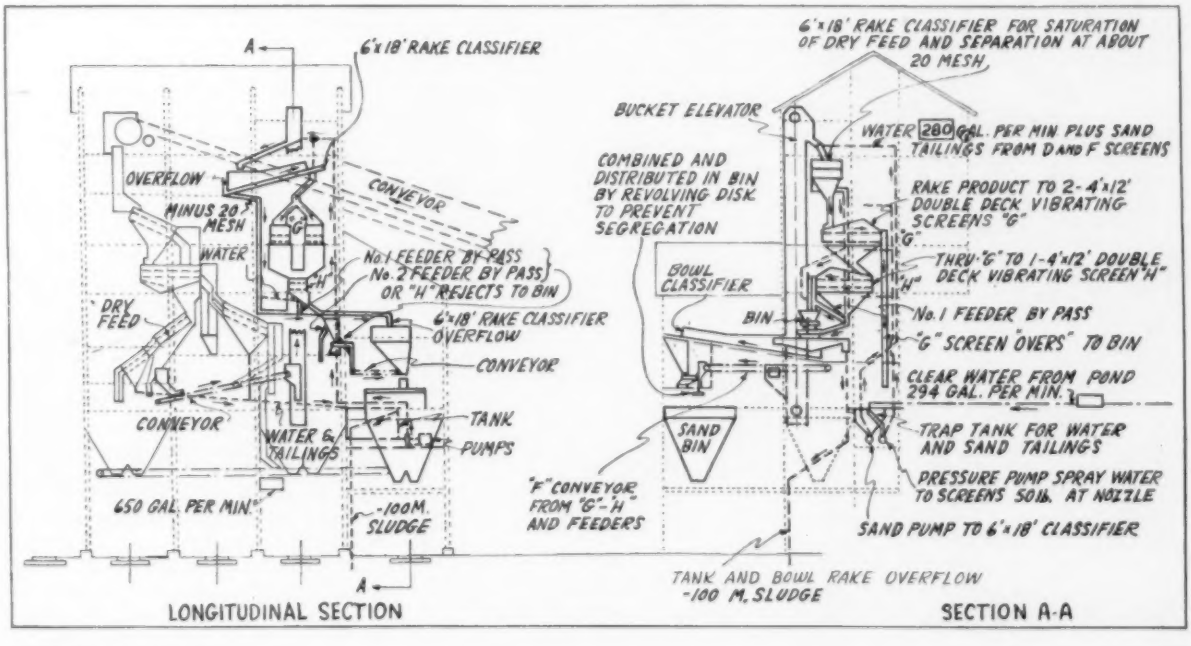
Passing Sieve	Percent
No. 4	95-100
No. 8	80-95
No. 20	35-60
No. 50	10-25
No. 100	3-6

For comparison, natural sand gradation, conforming with section 102 of Pennsylvania's specification is as follows:

Passing Sieve	Percent
3/8-in.	100
No. 4	85-100
No. 20	35-65
No. 50	5-30
No. 100	0-6

In comparing the two gradations, it is readily seen that the stone sand grading is more rigid. At least 3 percent must be through 100 mesh but no more than 6 percent, a very close tolerance, while for natural sand none was required to pass the 100-mesh (provided the through 50-mesh fraction is correct). Tolerances through the 50-mesh for stone sand are also closer, and on the top side, the stone sand must be finer. Having a high percentage of 50-mesh and 100-mesh particles in the product probably helped the water-holding properties of the concrete as poured, and the absence of particles larger than the No. 4 mesh prevented undue harshness.

Gradation and other requirements in the specification made it impos-



Sectional drawings of stone sand plant, showing flow of material through various steps in processing

sible to produce stone sand for the project in anything but a plant designed especially to manufacture stone sand. It was specified that stone sand be of approved quality manufactured from approved rock meeting quality requirements for Type A stone as specified in Section 103(a) of the general specification, and that it be of such character that *positive separation* into individual grains would be effected when crushed. Section 103(a) is the standard which limits slaty texture and cleavage planes, sets a maximum of 5 percent on the percentage of wear, sets a minimum toughness of 6, limits the amount of elongated particles, and defines how much deleterious materials may be contained.

It was further stated that plants manufacturing stone sand must meet the approval of the engineer and contain equipment designed to crush, wash and screen the stone sand to hold the grading analysis within the designated limits, and be so designed that the grading within those limits may be varied at the discretion of the engineer. Strength requirements were not to be less than those specified for Type A natural sand, and the maximum percentage of clay dust or other deleterious material removed by decantation was limited to 3 percent by weight.

At Annandale, Pittsburgh Limestone Corp. successfully filled the contract and is following the same specification in manufacturing stone sand for other construction. Screenings, the source material for the sand plant, are principally the product of blasting and of crushing. Sand production capacity normally ranges from 240 tons in 8 hr. up to nearly 300 tons but these tonnages are based on an output of 7000 to 9000 tons of flux stone and commercial stone in 8 hr.

The Annandale plant is one of six operated by the Pittsburgh Limestone Corp., its principal output being flux stone which is shipped to the various subsidiaries of the U. S. Steel Corp. Originally, the plant was built in 1912 to produce flux stone only. In 1931 it was rebuilt for the production of washed and unwashed commercial stone as well, in line with the policy initiated by any progressive producer to widen markets.

With the development of new markets, it is common for the plant to produce as many as 15 stone products simultaneously, but flux stone is still the major tonnage. Screenings production fluctuates, depending upon the stone produced, and at certain seasons a large percentage is processed into agricultural limestone. The sand plant was built to meet a demand for a graded stone sand for private as well as public construction.

Top to bottom—Fig. 1: Enclosed bucket elevator at right elevates dry screenings to rake classifier for separation at about 20-mesh. Fig. 2: Water pumped from trap tank at right by high-pressure pumps into chute or mixing hopper is added before the screenings enter the rake classifier. Fig. 3: At left is partitioned surge hopper, used to regulate flow of coarser particles to a belt conveyor on the floor below for recombination with the product of the bowl classifier shown at the right. Feed out of hopper is by gravity or by the electric vibrating feeders shown. Fig. 4: Bowl-rake classifier for recovery of the finer fractions of sand

Mining Eliminates Undesirable Materials

The stone at Annandale is a hard limestone, 96 percent $CaCO_3$, which is mined and therefore is free from clay seams and other materials of deleterious character. In mining the stone, rooms 40 ft. wide and 14 ft. high are being worked in a 20 ft. seam. About 70 percent of the screenings which eventually reach the stone sand plant are a product of blasting, the remainder originating in the crushing and subsequent handling. Drilling is done by drifters, driving a series of 1⅝-in. holes about 12 ft. in depth into the face, the line of holes being vertical and angling toward an adjacent row similarly driven. Loading is by electric shovel into rotary dump cars which dump into a 36-in. McCully gyratory crusher. Some of the smaller stone is bypassed the crusher by a grizzley to join the crushed product on a belt conveyor which discharges into a surge bin in the secondary crushing building.

Steps In Screening

From the surge bin, stone is fed out by a pan feeder to a double-deck scalping screen where the separation is generally plus 4½-in., 4½- to 2½-in. and minus 2½-in. Oversize is put through a 36- x 60-in. single roll (toothed) crusher, and when running considerable commercial stone the intermediate size is put through a 4-ft. cone crusher. All the output of the secondary crushing building is carried by belt conveyor to the screen house. There are no returns from the screen house to the crushers. Stockpiled stone is at times put through the secondary crushers, and on occasion some stockpiled screenings are reclaimed to the belt for delivery to the screening plant in making stone sand.

At the head of the screening plant, the stone is split equally to three batteries of five screens each. In order,

from top to bottom of the plant, the screens, all double-deck, are 5- x 10-ft. mechanical vibrating; 5- x 12-ft. mechanical vibrating low-head; 5- x 10-ft. mechanical vibrating; 5- x 8-ft. electric vibrating; and 4- x 6-ft. electric vibrating. The first two and the fourth banks of screens are for dry screening, and washing is done over the third and fifth banks of screens below.

About 95 percent of the feed to the sand plant is the material that goes through the bottom decks of the dry screens. Usually this deck has ¼-in. square openings or, sometimes, 0.213-in. or 3/16-in. openings. The remainder of the feed comes from the washing screens and consists of the fines washed off the larger lumps. A typical analysis of the screenings, with ¼-in. square openings limiting the top size, is as follows:

Passing Sieve	Percent
¼-in.	100
No. 4	99.89
No. 6	96.86
No. 8	84.41
No. 20	37.02
No. 50	17.65
No. 100	11.98

Principal equipment in the sand plant consists of a rake classifier, two identical screens designated as the "G" screens on the accompanying flow diagram, a single "H" screen, a bowl-rake classifier and a trap tank for water. The process is wet and consists of separating the screenings into separate fractions and re-combining in the desired amounts. Clear water from a reservoir is pumped into the water trap for makeup water.

Dry screenings from the main plant screens are conveyed by two belt conveyors (except when put in bins for stockpiling by truck) to an enclosed bucket elevator which elevates the material to a 6- x 18-ft. rake classifier. In passing through to the rake classifier the screenings enter an enclosed chute where water is added to wet and emulsify the material thoroughly. Water is pumped from the trap tank, under pressure, into the chute or mixing hopper to get the maximum agitation. Water from the lump stone washing screens always returns into the water trap, or vat, with a small amount of fines which are pumped to the rake classifier with the water. Water is added at the rate of 280 g.p.m.

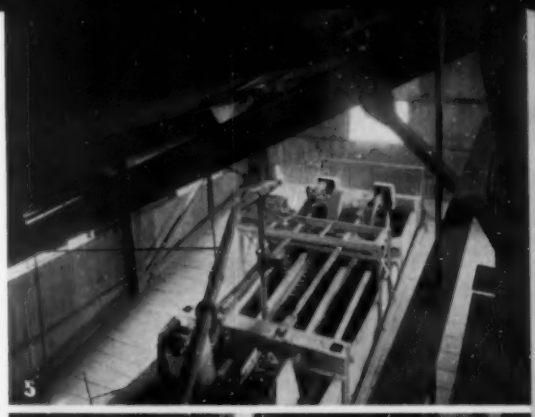
The rake classifier is designed to wash and separate the screenings at about 20-mesh. Collected screenings, plus 20-mesh, going over the drainboard comprise the feed for the vibrating screens, and the overflow, minus 20-mesh, is the feed for a "turret" bowl-rake classifier.

From top to bottom—Fig. 5: Bowl-rake classifier viewed from above. Fine sand particles are discharged at far end where they combine with coarser particles from the screens. Fig. 6: Coarse fractions from hopper in Fig. 3 are conveyed by the belt conveyor to a point over center of the sand bin, where the fine fraction drops through the chute from the bowl-rake classifier. Fig. 7: Close-up of arrangement to recombine sand just above finished bin. Note electric vibrating feeder used to feed fine particles coming from bowl-rake classifier. Fig. 8: Stone sand bin, showing drain pipes and special tight-fitting valves

From the first rake classifier, the dewatered, washed, coarser fraction enters a spout and is split equally to two "G" low-head double-deck 4- x 12-ft. vibrating screens on the floor below as the first step in screening the stone sand. Water is applied within the spout through a 2-in. line to help flow the material down to the screens. Screening of the coarser fractions is an important part of the overall operation, since by wet screening the correct fraction of the coarser particles must be rejected to build up properly the percentages of minus 20-mesh, 50-mesh and 100-mesh material.

Considerable study and experimentation was carried out before finally arriving at the screen meshes which would give an accurate split. Horizontal screens have proved advantageous, with washing under high water pressures, and the selection of screen openings is made according to the water pressure. Screening surface is large in relation to the tonnage handled, to give the material plenty of opportunity to be properly sized, and high pressure sprays over both decks are directed against the flow of material to wash, slow up and drive the particles through the cloth. Water pressures are about 50 p.s.i. and woven wire mesh cloth is used on all decks.

Both "G" screens have No. 4 mesh cloth on the top deck and a section of 5½-mesh followed by two of 6-mesh on the bottom deck. Oversize from both decks is by-passed as far as the stone sand operation is concerned, but is put in bins for other purposes. The undersize, through 6-mesh and containing a small percentage of particles up to 5½-mesh to control the coarser side of the gradation, is then put over the "H" screen, a similar 4- x 12-ft., double-deck washing screen. This screen has 6-mesh on the top deck and 8-mesh below, a controlled amount of the oversize from both decks and all of the minus 8-mesh eventually going into the stone sand.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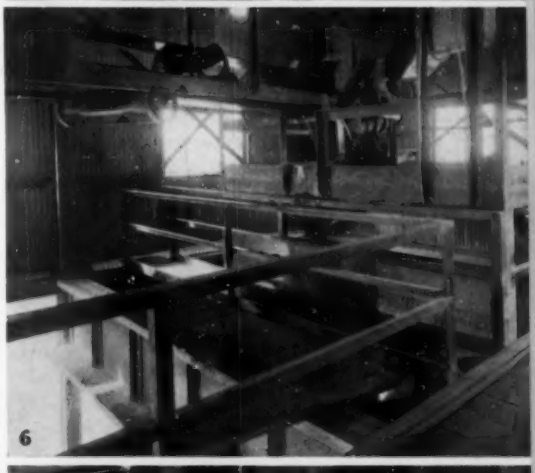
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The three products of this screen, plus 6-mesh, 6-mesh to 8-mesh, and minus 8-mesh, may each be put through the bowl classifier, with the minus 20-mesh from the rake classifier overflow; or the two larger fractions may be put into a specially-designed surge hopper to be proportioned out as needed. The hopper is an enclosed steel bin of special shape having two compartments with provision for feeding a definite amount to a belt conveyor. The hopper has a vertical partition so that each of two of the screen products may enter either compartment through a spout from the "H" screen. Each side tapers to an outlet at the bottom where adjustable slide gates regulate the flow to the belt conveyor by gravity, or an electro-magnetic feeder may be used. The belt conveyor discharge joins the bowl classifier product over the sand storage bin.

Function of the Bowl Classifier

Minus 8-mesh material always enters the bowl classifier while the plus 6-mesh and/or 6-mesh to 8-mesh product may be put separately into the hopper. Any fraction of either the latter products may be released to the belt. Or they may be put into the bowl classifier as needed. Excess of these sizes entering the hopper is wasted through an overflow pipe. On the back of the hopper there is a bustle, or enlarged section, which is filled with $\frac{1}{2}$- $\frac{15}{16}$-in. stone through which surplus water drains to an outlet pipe. Before this section was added excess water complicated the feed control to the belt.

Normally, plus 6-mesh and minus 8-mesh material are put into the bowl and only the 6-mesh to 8-mesh product into the hopper. By putting the 6- to 8-mesh material into the bowl classifier, all would be recovered, but it is desired to reduce the particles midway in the gradation to step up the 50-mesh percentage. This is done by regulating the slide gate at the hopper outlet. The other portion of the sand mix is the bowl product which is raked up to discharge directly over the sand bin where the belt conveyor discharges. The bowl is 14 ft. in diameter with an agitator speed of 5 to 6 r.p.m., utilizing about 900 g.p.m. of water. This classifier serves to classify the material by retaining between 3 and 6 percent minus 100-mesh, overflowing the excess 100-mesh sludge, and by mixing the sized material which comes from three sources. It is equipped with an attachment to introduce air under pressure, the purpose of which is uniformly to settle particles of critical size which otherwise might drop into the outlet to the rake mechanism in a surge.

Close Check On Gradation

Material from both sources, the hopper and the bowl-rake classifier combines in a common chute, or spout, directly over the sand bin. From the spout, the mixture impinges on a 30-in. diameter revolving disk directly over the bin. The disk rotates at about 100 r.p.m., throwing off the material by centrifugal force toward the outside of the bin, thus preventing segregation. About 10 percent water is contained in the sand, most of which is drained off through steel drain pipes. The bin holds 60 tons and is fitted with two diaphragm-type valves for loading into either trucks or railroad cars.

Frequent samples are taken to check the gradation, and when these tests show the need for adjustment in the recombining process, the slide gates at the surge hopper are changed accordingly. On large jobs, such as the Butler paving project, samples are taken every hour. They are taken at the revolving disk over the sand bin by sweeping an arc around its periphery and catching sand in a can as it is thrown off the disk. This is repeated until a total sample of 20 to 50 lbs. has been collected. A 500-gram representative sample is dried and screened in the laboratory near the plant.

Characteristics of the Stone Sand

Considering that no special crushing or grinding is done in producing the sand, the particles are very uniform in their shape, containing practically no elongated pieces. The color is a bluish-gray when wet and upon drying becomes quite light in color. Owing to the thorough control in the manufacture of stone sand the fine aggregate when delivered to the project in Butler was very uniform in grading and moisture content, resulting in a concrete which, according to the contractor, was finished in less time than a less uniform product. The resulting concrete showed no signs of harshness or "bleeding." On the Butler job, in an 8-bag mix, 37 to 40 gal. of water were used, the variation being due to the weather conditions rather than to the moisture content of the stone sand. The determination made by the Pennsylvania Department of Highways showed specific gravity of the stone sand to be 2.72.

The following quantities of concrete were specified for the Butler job (all proportioned by weight): 13,850 sq. yd. reinforced concrete pavement, uniform 9 in. in depth, mix—1:2:3.5; 2135 sq. yd. of high early strength cement reinforced concrete pavement, uniform, 9 in. in depth, mix—1:2:3.5; 49,640 sq. yd. reinforced concrete pavement 9 in. in depth at the sides, 7 in. in depth at the center, mix—1:2:3.5; 1000 sq. yd. reinforced concrete wearing surface for bridge floors, mix—1:2:3.5; 87 sq. yd. high early strength cement reinforced concrete wearing surface for bridge floors, mix—1:2:3.5; 500 cu. yd. class A concrete, mix—1:2:4; 68 cu. yd. high early strength class A concrete, mix—1:2:4; 890 cu. yd. class B concrete, mix—1:2:5.5; 510 sq. yd. concrete base course, Type A, 8 in. in depth, mix—1:2:4; 145 cu. yd. high early strength cement concrete base course, Type A, mix—1:2:4.

How to Improve Grinding

(Continued from page 34)

of product depending on the basis of measurement used.

If they are to be of value, grindability tests should be made frequently on material as fed to the mill and each determination correlated with prevailing conditions so far as possible. It is felt that in many plants grindability variables are probably the most important factors affecting mill performance and at the same time the ones most neglected. Development of a more rapid grindability test, which could be adopted as a routine laboratory procedure would undoubtedly be of considerable value in most cement plants. Impact grindability tests which have been used with some success require less time than the tube mill test described, but these do not correlate grindability with end product fineness or specific surface.

As an example of a variable grindability in clinker, Fig. 3 indicates a relationship found at a typical closed circuit operation. Weekly average surface bbls. per kw.h. of clinker grinding mills (preliminary and finishing units) are plotted against weekly average percentages of di-calcium silicate in the finished cement. During part of this period, considerable experimental work was done which affected mill performance to some extent. However, the curves indicate a definite trend for mill efficiency to follow clinker composition inversely as measured by the amount of this compound. In many cases, clinker grindability may be improved without sacrifice in quality by reduction in the di-calcium silicate content.

(To be continued)

Saving By Sand Settling

Article 11 on Washing and Classifying Sand. How to recover fines by the efficient use of a properly designed settler

By EDMUND SHAW

THE WRITER has designed a few plants in which the partial dewatering arrangement described at the end of last month's installment (February, p. 28) was used and found that it worked very well. The first was for the Stewart Sand and Material Co., Kansas City. The dredge was pumping to a settler on the railroad track about a quarter of a mile distant. To increase production it was decided to partially dewater the pump discharge at a point near the river, and a 14 ft. cone was installed, a valve at the apex connecting it to a booster pump. This cone not only served as a dewaterer, but it acted as a surge tank, and it also got rid of a lot of clay and unwanted fine sand. It worked well and the company built another like it.

Later the writer designed a plant to be installed on a Lake Michigan sand dredge which had an 18-in. pump. A great deal of fine sand had to be wasted to make a product that could be used as concrete fine aggregate. So a sort of preliminary classifier was designed to take the pump discharge and waste a large part of it; the remainder going through a gate at the bottom to gravel screens and a three-product classifier for making sands that could be blended.

From the success of these and of other installations of which he has heard, the writer believes that this preliminary dewatering is the best answer to the problem, where only one product is wanted and where there is no market for the fine sand that is wasted. The preliminary box dewaterer offers some control over the classification as well as reducing the feed to the settler. By decreasing the opening of the gate through which the feed flows to the settler, finer sand will be saved in the settler, and by increasing it so that a swifter current will flow across its surface the sand saved will be coarser.

Another, and perhaps more important point, is that by reducing the feed, the settler can be one of the commercial sand tanks, one of the tilting tanks which are made by practically all companies making sand and gravel machinery, or an automatic discharge cone, of the Dull or Allen type. It does more than save labor to install one of these; it makes a better product because the sand level and the basin made by the settled sand are always the same. Where power is easily available, as it is everywhere today, a mechanical classifier may be used, thus making a dryer product and cutting down the head room.

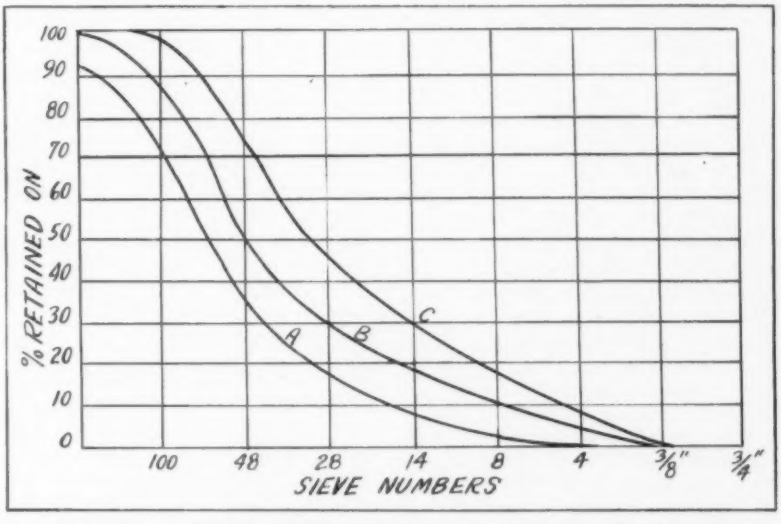


Fig. 1: Showing operating efficiency of sand settler. (A) River sand, F.M. 1.35; (B) Sand as settled F.M. 2.03; (C) Same after removing fine sand, F.M. 2.75

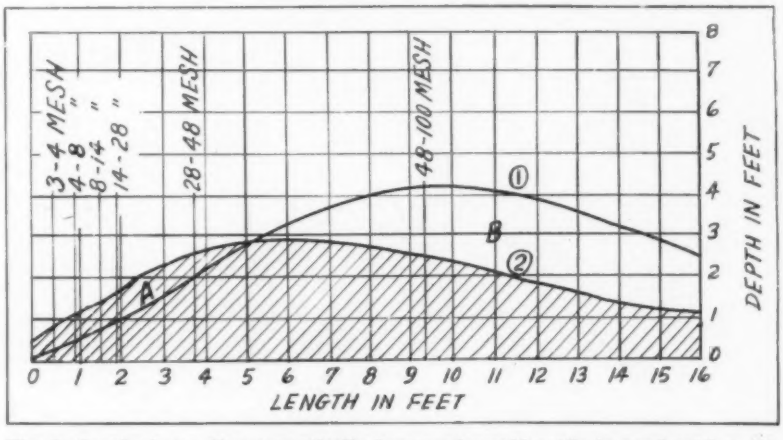


Fig. 2: Graph shows diagrammatically how sand would settle in sand settler. (1) Sand as settled F.M. 2.03; (2) Same after removing fine sand. F.M. 2.75; Area (B)—area (A) equals fine sand removed

Taking Two Products from a Settler

Curve A in Fig 1 is the grading of a fine river sand, such as is often dredged in Middle Western rivers. The fineness modulus is 1.35, and 30 percent passes 100 mesh. It has been estimated by a plotting method that the sand saved by pumping this to an 8-ft. settler, 16 ft. long, will be graded as shown in Curve B (Fig. 1). This has a fineness modulus of 2.03, which

is still too fine to be a good concrete sand. To raise the fineness modulus to 2.75, it is proposed to take out enough fine sand to do this through a special spigot, or gate. What remains in the settler will have the grading shown by Curve C (Fig. 1).

Fig. 2 shows diagrammatically how the sand would settle in the settler. With the waste spigot closed the outline of the pile in the settler would be the curve marked 1, and the highest point would be about where the 48- to 100-mesh sand would settle. With the waste spigot open the pile would have the outline shown by the curve marked 2 and cross-hatched. This is the sand having a fineness modulus of 2.75. The difference between the areas marked A and B would represent the amount taken out by the waste spigot.

This sand has been called waste, but it has value and may be sold as traction sand and for some kinds of plastering, and some industrial uses. Hence the settler was figured longer than would be needed to make a sand with a fineness modulus of 2.75.

The length was figured to be that which would split on about 65-mesh. The velocity of the current was found by taking the depth of the current as the head over the discharge weir, which may be found in a table that is given in many engineering pocket books. In this case it is 0.45 ft., and multiplying by 8 gives the cross-section area as 3.6 sq. ft. The volume of the feed will be reduced somewhat by the settling of the sand, so the flow over the weir has been assumed to be 8 cu. ft. Eight divided by 3.6 gives, 2.2, which is the velocity in ft./sec.

As a 65-mesh grain settles an inch a second, it would fall 7.7 in. by the time it reached the end of the settler, $(16/2.2 = 7.7)$. As the current is only 0.45 ft., or 5.4 in. deep the grain would sink to the bottom of the current before it reached the overflow. In the eddies below the current its chances of going up or down would be about equal.

In addition to saving about half of the 65-mesh grains, this length would save most of the light 48-mesh and the heavier 100-mesh grains.

The detail of construction that most affects the design, and therefore the work of a settler is the construction of the sides. These should be smooth from end to end, and nothing should project from them into the current. Where rods have to be passed through to keep the sides from spreading they should be placed well below the current.

(To be continued)

Impracticable Gravel

By IRVING WARNER*

IN THE PREPARATION of the Simplified Practice Recommendation for Coarse Aggregates, and in the approval of those specifications by the producers, an important point seems to have been completely overlooked.

The general principle of the Simplified Practice is good but there is a detail which will make these products difficult to produce and probably cause an erratic grading which will be a disservice to the user.

A certain principle is carried through these specifications. Materials bearing alternate numbers are intended to be paired together to form a complete coarse aggregate. It is apparently presumed that the plant will produce these two materials simultaneously by a single screen separation at the theoretical point of division. The principle is generally carried through the specification that the larger aggregate is specified at 0 to 15 percent passing this theoretical point of division and the smaller material specified 90 to 100 percent passing.

Few Plants Equipped to Produce New Gradations

Consider the case of No. 3 and No. 57, Chart II, which will be a generally acceptable combination of sizes for concrete pavements. The theoretical dividing screen, 1-in. No. 3, specifies 0 to 15 percent passing 1-in. No. 57 specifies 90 to 100 percent passing 1-in.

It must be inferred that the Simplified Practice Committee believed that the producer could use a 1-in. square screen in his plant and thereupon could safely and continuously produce a No. 3 aggregate with less than 15 percent tramp undersize; that is the percent passing the 1-in. screen. With a new screen, the No. 57 would show 100 percent passing 1-in., but as wear or wire displacement took place with age, the 90 to 100 percent specification for the No. 57, would give the necessary margin of safety.

It is submitted that a properly equipped plant, operated at a generally acceptable rate, cannot produce a material which will safely and continuously show less than 15 percent passing a test screen of the same size as the plant screen over which the material is screened.

It must here be noted, that a producer may not safely approach the limit of a specification. Subsequent to its production at the plant, the material is subject to much abuse from bad handling, segregation, breakage, etc. Correct sampling is

*From a discussion of the practicability of the Simplified Practice Recommendation for Coarse Aggregates, U. S. Bureau of Standards, R163-39, at the recent convention, National Sand and Gravel Association at St. Louis, Mo.

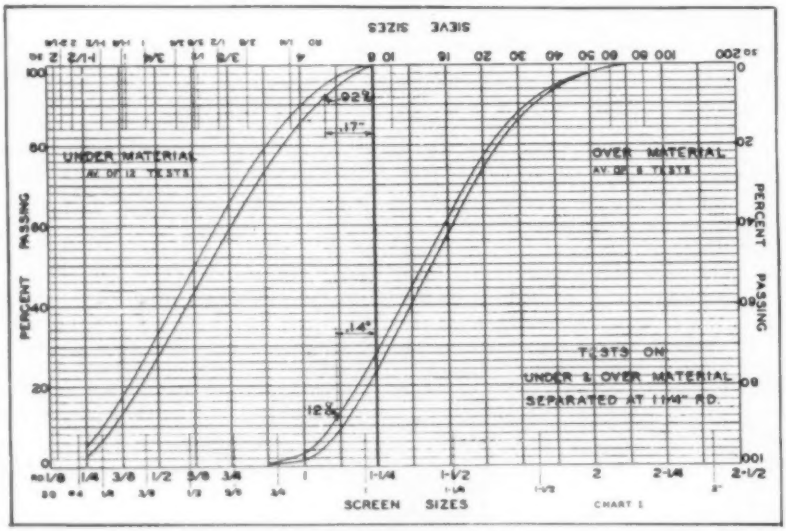


Chart I. Showing graphs of over and under material, separated at 1¼-in. round openings, produced at the Van Sciver plant. Note that screen sizes are given below, and sieve sizes above

Specifications

Screening difficulties in meeting Simplified Practice Recommendation for coarse aggregates points to necessity for changes in specifications

difficult and is too frequently done by inexperienced young men who may be quite impractical and over-conscientious.

If a specification says 15 percent limit, then the producer is well advised not to let his product go out at more than 10 percent. An outside limit is 12 percent and this figure is used herein in further discussion. When No. 57 says 90 to 100 percent passing 1-in., then an irreducible safe minimum is 92 percent and 94 percent would be much safer.

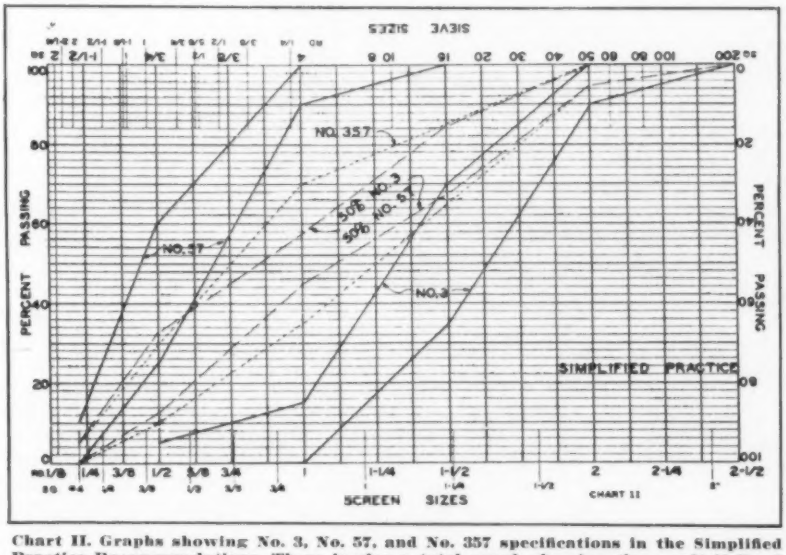


Chart II. Graphs showing No. 3, No. 57, and No. 357 specifications in the Simplified Practice Recommendations. There is also a total graph showing the result if No. 3 and No. 57 are combined in the field on a 50-50 basis

Tests at Van Sciver Plant

In order to make a practical check, detail tests were made in the Van Sciver Plant of the Warner Co. The raw material of this plant is a hard, clean gravel, uniformly graded by nature with no preponderance of one size which causes production troubles.

The gravel is first limited by crushing and screening at 2⅛-in. round. The gravel, freed of sand and some of the grit, is fed to two banks of screens. Each bank receives a momentary maximum of 300 tons per hour, the average being less.

Each bank consists of a 6- x 19-ft. rotary screen equipped with 1¼-in. round openings throughout its length. The tailings then go over a 4- x 8-ft. vibrating screen which also has 1¼-in. screen openings. This plate is very thin, only ⅛-in. in order to secure more efficient screening. The rotary screen passes roughly 180 tons per hour, tailing 120 tons to the vibrator, which in turn passes a small additional amount of about 10 tons per hour.

On Chart I, is shown the graphs of the over and under materials thus made. Those familiar with graphing will recognize that this screening job at 1¼-in. round is unusually efficient. Note the abruptness of the graph of the under-material as it approaches the 1¼-in. limit and the complete absence of the long "goose neck" at the top that is characteristic of most aggregates.

In the case of the larger material, the percentage smaller than 1¼-in., runs from 23 percent to 28 percent. Tests were made at close steps of 1¼-in., 1⅛-in., 1-in., ⅞-in. and ¾-in., to ascertain the exact graph. On the larger material, six tests were made under normal varying operating conditions, and the double graph shows the upper and lower limits of the six tests.

An illustration of the erratic action of screens when not operating normally is shown in Chart III. In this case, three special tests were made, each test consisting of sampling and testing the over-product when the plant was running fully loaded and normally, followed immediately by sampling when operating at half capacity, thus eliminating so far as possible any other variables.

These two full lines show the limits of the three tests when plant was fully loaded. The two dotted lines show the limits when half loaded. Although one of the half loaded tests showed as low as 10 percent passing the same 1¼-in. screen as used in the plant, the maximum result was 20 percent. This wide variation in results is a characteristic of a fractionally loaded plant with which operators are well familiar. On the other hand, whereas the normally loaded results are higher (20 percent to 23.6 percent passing 1¼-in.) the maximum and minimum lines are close together. This consistency of results is also to be noted on Chart I. The maximum and minimum lines of both products lie close together. In the case of the under-material, 12 tests were made and with the over-material, six tests were made, both under widely varying plant conditions and on different days.

Suggest Changes in Specifications

It is respectfully suggested to the Simplified Practice Committee that they make No. 357 somewhat less tolerant at the middle point of 1-in. and then so specify No. 3 and No. 57 that when used in the desired proportions such as 50 percent of each, the resulting combination will have substantially the same gradation tolerances as the Revised No. 357.

The same consideration should likewise be given to the other pair of combinations so that any principle adopted is carried throughout the sequence of sizes.

There is already a precedent for this in the Simplified Practice itself, No. 5 and No. 7 go together to form a No. 57. At the dividing point of ½-in., No. 5 shows 15 to 35 percent and No. 7 shows 90 to 100 percent. However, it is not believed to be necessary nor wise to go as high as 35 percent passing the under screen. A figure of 30 percent would be ample, but the 90 to 100 percent passing for the under material is too close. This should be changed to 80 to 100 percent. With a 50-50 mix, the combination would show 40 per-

cent to 65 percent passing 1-in., a tolerance which is much closer than the 35 to 70 specified for No. 357, a tolerance which in practice is further reduced because of the producer's double margin of safety on two products.

Thus in combining any pair, the resulting mixed product will show a very close tolerance, actually approximating the 45 to 57½ percent now shown on Chart II of the 50-50 mix of No. 3 plus No. 57. Even better for the user, the product of any one plant will show a high degree of consistency so long as the plant is operated naturally and normally. But if the operator is compelled to resort to trick methods in order to meet an unnecessarily harsh specification, the product will surely exhibit considerable variation within the limits of the specification.

Taking necessarily the least favorable graph, it is to be noted that the curve passes the 12 percent line at a point which scales 0.14-in. smaller than the 1¼-in. screen used in the plant. In effect, this means, that so far as this plant is concerned, in order to hold down to 12 percent or less on any size screen in this magnitude (say 1-in. sq.) the actual screen used in the plant must be larger than the specified screen by at least 0.14-in. As the screen wears, the margin obviously becomes safer.

Consider next the under-material. It is to be noted that the less favorable graph passes 92 percent, the lowest safe limit, at a point 0.17-in. smaller than the 1¼-in. through which the material is screened. This means that the producer may use a screen, when old and worn, up to 0.17-in. larger. Obviously, the new screen must start in smaller to allow for wear.

Thus, theoretically, we have the following figures:—

To make the under-material right, the screen may not be larger than that specified by more than	0.17 in.
To make the over-material right the plant screen must be larger than that specified by at least.	0.14 in.
Margin for wear, etc.	0.03 in.

Obviously, this net tolerance of 0.03-in. is insufficient for safe production.

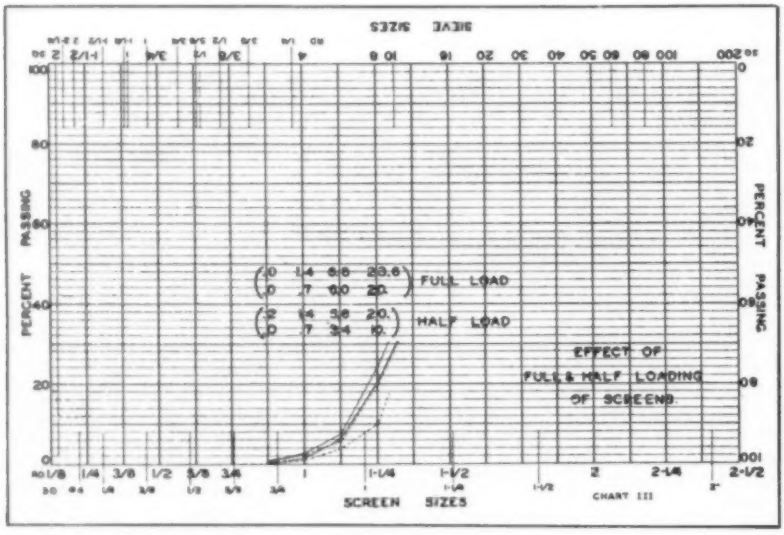


Chart III. These graphs illustrate the erratic action of screens when not operating normally. Three tests show the effects of full and half loading of screens

There is a modification of the above data which helps the situation to a moderate degree, but insufficiently to solve the problem. It is evident that the upper limit of the larger material tested is rather low. To compare to Simplified Practice No. 3, the upper limit should be raised from 2⅛-in. round to 2½-in. round. A mathematical study indicates that the graph showing 28 percent at 1¼-in. would come down to 21 percent and the 12 percent intersection point will reduce to 0.12-in. from the previously noted 0.14-in. This increases the tolerance from the above noted .03-in. to .05-in., but this is still quite insufficient for all the vicissitudes of production.

Production Difficulties in Meeting New Specifications

It is therefore evident that the producer can make any two of these paired sizes only by removing a "middlings." At the plant just discussed, it will be necessary to use two screens ⅛-in. apart with the middlings returning to the crusher. Less efficient screening may require a differential as great as ¼-in. There may be some plant that is greatly over-screened that can produce these paired materials with a single separation, but it will be a rarity.

If any producer is making a full sequence of Simplified Practice sizes, as for example, No. 3, No. 4, No. 57, No. 67, etc., then the No. 4 can be used as a middling for No. 3 and No. 57. The No. 5 fraction of No. 57 can be used as a middling for No. 4 and No. 67. But there will be very few producers who will make the full sequence.

Those who do make everything and use the alternate sizes as middlings to be removed, will find that they have a very costly operation whenever the sale of the different pairs are not in balance. From the users' standpoint this is very bad, since the products will vary greatly, although within the specification.

In the design of concrete, it is most essential that the aggregates be reasonably consistent in their grading. Consistency is of greater importance than adherence to an unnecessarily harsh specification.

This brings us to the question as to the value of these specifications to the buyer. Chart II shows graphs for No. 3 and No. 57; also a total graph if these aggregates are combined in the field on a 50-50 basis. Also is shown No. 357 which is one of the fully graded specifications of the Simplified Practice.

The graph of No. 3 plus No. 57 exhibits an astonishing narrowness at the middle. In practice, this will be more pronounced, for the producer should have his margin of safety of five points with *each* material. No concrete engineer needs or expects such a narrow tolerance at the middle point of his coarse aggregate. It is usually considered that reasonable tolerance is permissible in the middle, but that more precise limits should be used at the ends. The graph of No. 3 plus No. 57 exhibits the reverse characteristic.

That greater tolerance is permissible in the middle is made evident by the graph of the fully graded aggregate No. 357. It is excessively wide where No. 3 plus No. 57 is narrow. Both specifications were prepared by the same Simplified Practice Committee, yet both cannot be right.

It is the opinion of this writer that No. 357 is entirely too broad for good practice and No. 3 plus No. 57 is unnecessarily narrow so that it works a hardship on the producer and will cause the user trouble from a grading that is erratic even when within the specifications.

Washing Crushed Stone

ARTICLE TWELVE

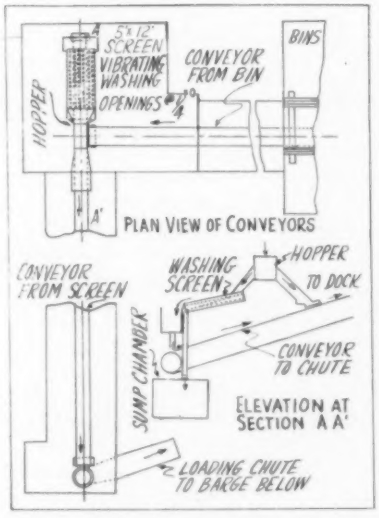
On crushing, sizing, testing and specifying aggregates — Washing desirable in some instances

By ELWOOD T. NETTLETON

IT HAS BEEN the experience of one company with which I was connected that where conditions are ideal, washing of crushed stone has very little advantage and even in some cases has a disadvantage. If ledges are properly shipped, the stone is dry; the crushers and screens are not overcrowded; and self cleaning bins are used, there is no trouble from dirty or dust-coated stone.

To wash this stone would dampen the surface of the stone so that dust and dirt from the air in transit would adhere very readily. The stone might even arrive on a highway job so damp that asphalt could not be applied when desired. However, these ideal operating conditions are not always present in everyday operations. The stripping of bins and the screening might be controlled properly, but the weather conditions and the necessity of stock-piling large amounts of stone alter the situation considerably.

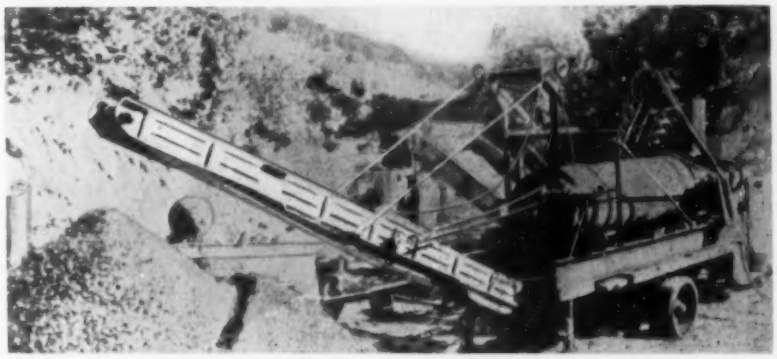
Since clean stone put in stock pile becomes dirty after a period of time, to gain any advantage by washing crushed stone, it becomes necessary to wash it only a short time before shipment, but long enough ahead so that the stone has had a chance to dry out. Probably the chief difficulty arises when a producer is called upon to furnish large quantities of crushed stone of the smaller sizes to be used with bituminous material in highway construction.



Stationary plant for washing all sizes of crushed stone has a loading capacity of 500 tons per hour

Portable Washing Plant

Faced with the problem of washing the stone, experiments were made with a portable washer mounted on a truck body. The advantage of this method is in having a movable washer which may be transported from stock pile to stock pile and even from one quarry to another.



Portable washing plant comprises a truck, elevator, washing drum, and conveyor

F. H. Edwards, general superintendent of the New Haven Trap Rock Co. was responsible for a machine of unique design and construction which cost approximately one thousand dollars. The truck, elevator, washing drum, and conveyor are driven by the truck motor through a series of chains, sprockets, and shafts, salvaged from junk. The capacity is from 10 to 30 tons per hour, depending upon amount of water admitted which is nominal. At 10 tons per hour a ¾-in. stream will suffice; at 30 tons per hour a 2-in. stream will suffice; the operating cost per ton ($.10) does not include the cost of machine, but does include loading, material, transporting to and from storage, gas, oil, and all labor pertaining thereto.

This washing outfit had been used on ½- and ¾-in. stone at the Plainville and Cheshire quarries of the company, when this was written. The average run of stone, before washing, appeared very dirty and would have been rejected by any inspector on bituminous work, or even where cement was used. The appearance after washing was greatly improved, and from visual inspection looked satisfactory. The actual tests showed 4.3 percent dirt and dust before washing and 0.5 percent after washing. The stone was loaded directly into trucks after the washing and then ramped into railroad cars for shipment.

Stationary Washer

The North Branford quarry of the New Haven Trap Rock Co. is connected by the company's own railroad to Pine Orchard dock. At the latter point shipments are made by tidewater. Here all sizes of crushed stone can be washed. The amount of water used and the disposition of the dirt, dust, and wash water is not so serious a problem here as at other quarries.

This plant has a loading capacity of 500 tons per hour of either washed or unwashed material. In washing, the stone is scrubbed from five sprays with a nozzle pressure of 35 p.s.i. After washing, the 50-ft. conveyor loads the stone directly to the barges. Wash water is pumped to the screen by a 4-in. Morris, horizontal, single-stage pump at the rate of 250 gal. per min. under a 20-ft. head. A 4-in. type S Morris Slurry pump takes the silt and water from a pump

below the screen and discharges about 3000 ft. from the loading plant into a settling basin. A 40-hp., G.E. motor drives the fresh water pump and one of 25 hp. drives the slurry pump.

The stone before washing at this plant, as a rule, does not average as much dust and dirt as is shown in the portable washing tests at Plainville. In most cases the amount of dust or dirt is less than 1 percent. Although no accurate tests were made, it is probable that less than ½ percent is removed by washing. The chief reason for washing, in this case, is the fact that competitors in the marketing area serviced by this plant wash their stone, and the engineers and inspectors think they are obtaining a much better product. Actually, very little advantage is gained for the cost and trouble involved although, no doubt, the engineer feels a greater degree of certainty. Perhaps it is better insurance for the producer. However, experience, visual inspection, and actual tests by the producer could easily ascertain whether or not any particular products need washing.

The cost of washing at Pine Orchard was as follows:

Labor and supervision (No additional laborers or supervision are necessary as the dock handling crew can handle it)	—
Depreciation 10% on $5000	$ 500
Repair and maintenance Screen sections Pump parts Replace sections of pipes, new valves, etc.	250
Power—for 2 pumps and vibrating screen for slurry	1000
Approximate annual tonnage washed, 125,000	$1750

$\frac{\$1,750}{125,000}$ = $0.014 per ton—average cost of washing.

(To be continued)

Quarry Shovel Loading And Haulage

Reviewed by NATHAN C. ROCKWOOD

From a U. S. Bureau of Mines Report

THE United States Bureau of Mines has recently issued Reports of Investigations Nos. 3461 and 3467 on time study analyses of quarry shovel loading and quarry haulage, by J. R. Thoenen and E. J. Lintner. These reports will be found to contain a great deal of interesting and thought provoking material. Their chief value perhaps is in illustrating a scientific method of analyzing and comparing performances of quarry equipment.

Since the reports and conclusions were based in most cases on a single day's, stop-watch observations it is open to doubt if the data are a fair criterion of any one of the quarry operations. Certainly no operator would draw very extensive conclusions from a single day's observation of his own or some one else's operations. Nevertheless, they serve to illustrate the advantage to an operator of making, or having made for him, a careful study of the efficiency of quarrying methods.

Study Covers 21 Quarries

The quarries studied were 21 in number. The heights of quarry faces varied from 32 to 200 ft., worked in both single and two-bench operations. Trap, granite and limestone were included. The daily output ranged from 240 to 1215 tons, which apparently makes the report a fair "Gallup poll" of the industry as a whole.

All 21 quarries were equipped with power shovels for loading, 25 shovels in all, of which 13 were steam shovels, 11 electric and 1 Diesel powered. The smallest shovel used was 1¼ cu. yd. and the largest 4 cu. yd. The weighted average size figures out a little over 2 cu. yd., which as a matter of fact is also the most popular size, there being 10 of 2 cu. yd. size to 5 of 2½ cu. yd. size, the next most popular.

Of the 21 quarries 7 were equipped with locomotives and cars for haulage, the others with motor trucks. Of the entire 23 locomotives 17 were 16-ton size or larger, 9 being 20-ton and 3 being 35-ton. All of these large size locomotives (16-ton and up) were used for hauls of from 1300 to 3300 ft. This bears out observations made by the editors of ROCK PRODUCTS that the motor truck is competing with railway haulage in quarries chiefly for short hauls of less than 1300 ft. It has displaced small locomotives and small-car trains but not the more substantial equipment in many instances.

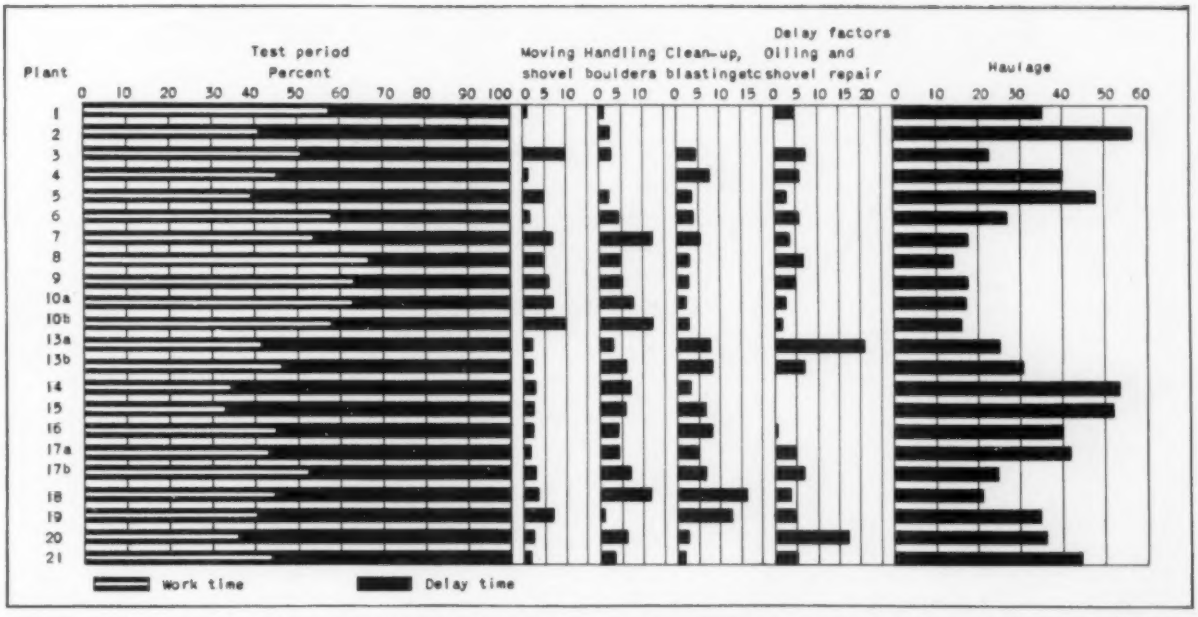
The causes of shovel loading delays are shown graphically in the accompanying chart. It is obvious, of course, that the relative lengths of these delays would vary considerably in the different quarries from day to day. Nor does averaging the 21 quarries appear to allow fairly for such delays.

Loading Efficiency

Ratings of the efficiency of each quarry took into account (1) "loading" efficiency, which is the comparison of tonnage actually produced with the maximum theoretically possible; (2) "operating" efficiency, the comparison of tonnage actually produced with the theoretically possible during the timed period; (3) "runner" efficiency, the direct comparison between tonnage produced and what should have been produced at the timed rate of operation; (4) "time" efficiency, the comparison of the actual working time with the full working shift.

Quoting directly from the report: "Of the four established ratings, the 'loading' figure is consistently lowest and the 'runner' rating is highest, except at one quarry. Inasmuch as the loading rating embraces losses from all causes, it naturally should be lower than the others. Even so,

Typical semi-trailer truck quarry loading operation studied by engineers of the U. S. Bureau of Mines in arriving at conclusions as to relative efficiencies



Causes of shovel delay in loading stone at the quarry face: Moving the shovel; height of the face and the necessity of moving for blasting are factors. Handling boulders means the jiggling around to get over-size boulders in or out of the dipper—a common cause of loading delay as the chart shows. Cleaning up after blasting or waiting for secondary blasting of boulders needs no explanation. The delay caused by oiling and shovel repair includes relocation of electric power line, fueling and time lost by the operator himself. The preponderance of haulage delays is self-evident

it is somewhat surprising that only one quarry had a better than 50-percent rating. Search for the cause for this low rating discloses that customary delays as represented by time efficiency accounts for the greatest loss in most cases."

Time Efficiency

The time efficiency, it appears, is the efficiency of the quarry management in eliminating causes of delays to the productive operation of the shovel. The cause for greatest delay was haulage difficulties, which the authors of the report state would be eliminated entirely by supplying a surplus of haulage units so that the shovel need never wait for empties.

Probably that fact was evident to the managements as well as the investigators, but if the truth were known, probably the quarry managements were reluctant in 1938, when these data were gathered, to spend money for extra equipment and extra labor to operate it merely to keep shovels busy producing stone which could not be marketed. That illustrates another reason why this report may not be a very accurate measure of quarry operating efficiency. At the time the study was made operators probably were more concerned with trying to provide employment for their labor than with producing stone at the utmost efficiency. It takes *volume production* to get real efficiency.

From the point of view of most economical operation a quarry owner, theoretically at least, should produce at maximum capacity for the shortest possible time to fill his orders. Probably every owner knows this, but he can't produce in advance of orders because of the wide variation in specifications. The foremost consideration, the last few years, has been to operate enough of the time to provide his labor with subsistence wages; and probably that would not have been possible if he had produced with the best possible efficiency. Naturally, the writers of an engineering report do not go into these non-technical considerations, yet they are often just as pertinent as technical ones, and a quarry management is not necessarily inefficient because it takes them into account.

Haulage Efficiency

The authors state that "haulage efficiency depends upon many factors responsibility for which is divided. Only in a relatively few instances are delays to the haulage system chargeable directly to the operating personnel. Likewise, few opportunities arise to increase operating efficiency above that provided for in the original design of the system.

"Proper design of the system is therefore of primary importance for efficient operation. Such design will provide for operation over the designated route of the prescribed number of units at an assigned speed and without interference with each other at either loading, dumping, or intermediate points. Travel speed and timing are important. Assigned travel speed should be less than the maximum of which the equipment is capable. When so gaged, the operating personnel frequently may maintain schedules by increasing running speed when needed following an unexpected delay."

Feeding Efficiency

The importance of a feeding device for the primary crusher is emphasized. This appears to be more important when the haulage equipment is comprised of locomotives and trains than in the case of motor trucks. The trains haul more and there is more tendency to choke the crusher—and delaying the trains delays the shovels.

The authors conclude that whereas management efficiency dropped as low as 50 percent and design efficiency to 42 percent, the efficiency of haulage personnel never fell below 88 percent, illustrating their contention that a study of internal plant processes and their coördination will divulge interesting possibilities for potential savings in production costs.

Other interesting studies of quarry operation are in the course of preparation including one on drilling for the most effective blasting and breaking.

Grinding and Flotation

Are principal subjects of interest to rock products operators, discussed at meeting of A.I.M.M.E.

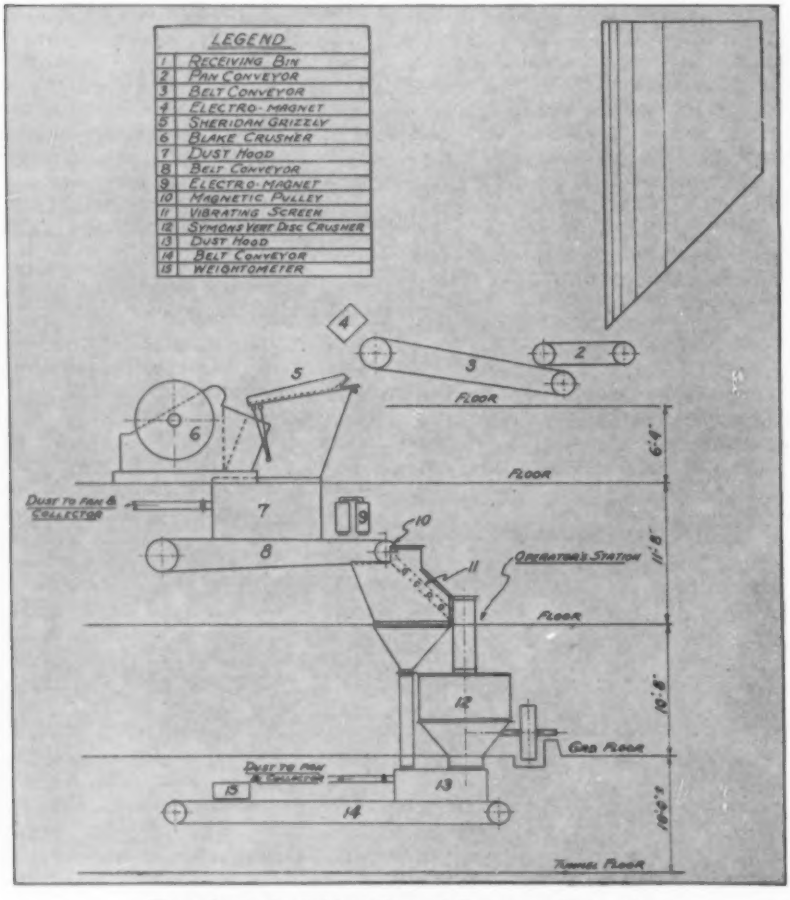
By NATHAN C. ROCKWOOD
Member A.I.M.M.E.

THE ANNUAL FEBRUARY MEETINGS of the American Institute of Mining and Metallurgical Engineers are like a three-ring circus so far as diversified interests are concerned. One often wishes to be able to attend three simultaneous sessions. However, since that is impossible, the next best way to report the meeting for our industry is to abstract those papers which seem of most importance to it.

Crushing and Grinding Developments

To the engineer or plant operator interested in crushing and grinding, it is immaterial whether rock is being crushed and ground for ore or for cement or aggregates. Those who have developed the science come usually from two different schools of practice, which makes their independent developments all the more interesting to those who have approached them from the other angle.

A good example was a paper by J. F. MYERS and F. M. LEWIS on "Crushing and Grinding Practice, Tennessee Copper Co.", from which the accompanying illustrations are taken. The crushing and grinding plant was rebuilt in 1938 to have 1350 tons per day capacity, using the same major equipment installed in 1928 to produce 900 tons per day. The two flow sheets are shown on page 48.



Flow sheet of crushing plant of Tennessee Copper Co.

Definite Use for Rod Mills

Practice in this metallurgical plant differs from that of the average cement plant because it is here recognized that "the reduction of ore particles larger than 1-in. is definitely a crushing problem, and the reduction of ore particles smaller than ¼-in. is definitely a grinding matter." Cement mills are fed with material as coarse as 1½-in. The authors state that "the reduction of ore particles between 1-in. and ¼-in. has long been a subject of controversy, and the answer probably differs with different ores and conditions." In this case they found rod mills operating at about 18 r.p.m. "had marked ability to reduce crushed ore from 1-in. or ¾-in. down to a 10-mesh or 20-mesh product." That point ought to be highly interesting to stone sand producers as well as cement mill operators.

The advantages of the rod mill in the flow sheet are given as follows: (1) removes the necessity of closed-circuit crushing, with its screens and return equipment such as conveyors or elevators; (2) reduces cost of dust collection, as closed-circuit systems greatly increase the number of points that generate dust; (3) on an ore that contains wet or sticky material an open circuit is much easier to handle; (4) makes possible an increase in production without installation of other new equipment; (5) when ore is slightly damp, it is easier to feed the grinding mill if some coarse particles are present in the feed. The paper gives much interesting data on the performance of rod mills.

Dust Collection

Because of the simple crushing arrangement, collection of dust is required only under each of the two crushers. The dust hoods under each crusher are drafted by separate fans, run at sufficient speed to draw air through the ore in the crushers. Fig. 3 shows the dust-collector installation on the Allis-Chalmers 24x36-in. jaw

crusher. The Symons crusher is a 48-in. vertical disk type.

Launders

Launder is a term not so much used in the sand and gravel industry as in mining, but a sand and gravel plant is made up very largely of launders, which are the flumes or troughs which connect one screen or classifier with another, or with a bin. A paper by HAROLD LINKE, Utah Copper Co., described how to design launders, including junction boxes, distribution boxes and vertical down spouts. These details of sand and gravel plants often receive little attention from designing engineers, but the slope of the launder is governed by size of grains and by the percentage of solids and their specific gravity.

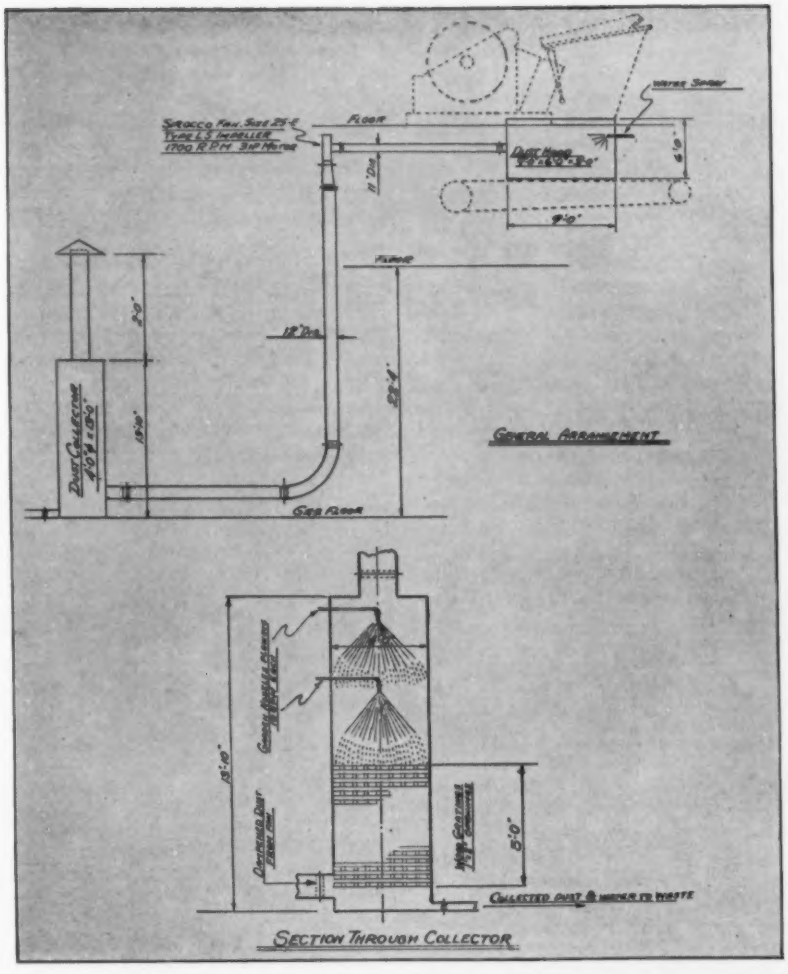
Wear and Distribution of Grinding Balls

FRED C. BOND, Allis-Chalmers Manufacturing Co., described the results of nine years' tests of the wear of grinding balls at his company's laboratory. He said that: "Careful determination of size distribution below the limit of sieve sizes indicate strongly that under ordinary grinding conditions the amount of new surface area produced is directly proportional to the net power input. Changes in the size ratio between the balls and the particles cause important differences in the proportion of the product that passes a given mesh size, but do not affect the total amount of new surface area; they merely change the distribution of the surface among the mesh sizes."

The significance of this to the cement industry, as applied to clinker grinding is noteworthy, since there is much reason to believe that the properties of a cement are determined quite as much by its particle size distribution as by its surface area as such. In other words, as we see it, the same mill can produce cements of different characteristics because of changes in the size distribution of grinding balls due to ball wear.

The author develops a formula for ball wear in order to compute an "equilibrium" ball charge, for which a formula is also given. The discussion involves the whole theory of ball-mill grinding, and as such will be found interesting and helpful. Among the conclusions drawn is this: "The calculations indicate that in most mills operating in closed circuit with fairly large particles in the new feed, the proportion of smaller balls in the charge should be higher than that obtained by feeding only balls of the size necessary to break the largest particles."

The author adds: "It is probable that the distribution should be computed so that there is no deficiency of the larger balls at any size, and the unavoidable excess of very small ball sizes in the equilibrium charge is balanced by an equivalent excess in the larger sizes. The balls are rationed according to size distribution of the particles entering the mill, and not according to the average particle sizes within the mill."



Dust collector installation of unusual design on primary crusher at plant of Tennessee Copper Co.

Deleterious Coatings on Grinding Balls

Another paper of particular interest to cement plant operators was one by FRED C. BOND and FRED T. AGTHE, Allis-Chalmers Manufacturing Co., on "Deleterious Coatings of the Media in Dry Ball Milling." This describes an attempt to determine the cause of dust coating of grinding media from experiments with a laboratory mill. The problem investigated is stated by the authors: "When some materials are ground dry in a ball mill, a stage of comminution is reached at which the finely divided particles begin to adhere to the balls and to the mill lining. As grinding progresses, a coating accumulates upon the grinding media, which tends to cushion the impacts and thus retard reduction of the material, and finally becomes so thick that all grinding ceases. At this stage the characteristic noise produced by the grinding media during normal mill operation changes to a dull, muffled sound."

The investigation and plant experience shows that some minerals coat grinding media more than others—this is true even in the case of different cement clinkers. The authors state: "The presence of a considerable amount of relatively coarse particles in the mill charge inhibits coating, which becomes serious only after these particles have been reduced in size." A small amount of moisture in the feed of many materials tends to increase coating, but to decrease it in the case of cement clinker. The temperature of the mill charge is a fac-

tor. The character of the grinding media does not appear to be a factor.

The authors examine the static electrical theory as a cause of coating (electrically charged particles), but reject it as an explanation. They then go into the theory that adsorption or changes in the surface character of the particles can explain the coatings. Adsorption they say may decrease coating by the stronger retention of the air film upon the adsorbed surfaces, and to this they attribute the helpfulness in clinker grinding from addition reagents (grinding agents like coal, resin, patented lignin compound) [TDA probably, although not mentioned by name.—EDITOR]. The best results of all tests was obtained with the latter reagent—99.6 percent through 200-mesh, 95.8 percent through 325-mesh, specific surface area 2330—with practically no coating. A sample of the same clinker (and gypsum) ground to 85 percent through 200-mesh, 78.8 percent through 325-mesh, 1715 specific surface area, completely coated the balls without the grinding aid.

Our own knowledge of physical chemistry may be sadly lacking, but it seems to us that the authors have attempted to draw a fine distinction between electrostatic phenomena and adsorption phenomena in a field where no one seems to be very sure which is which. In any event, there are obviously substances which have the property of charging or coating the particles to be ground, or the grinding media, or both, so that repulsion of the two takes place instead of adhesion.

The authors believe that the coating of the grinding media is accounted for by mechanical causes — briefly, that the balls are scratched and the impacts pound the smallest fractions of dust into the scratches, wedging in the next larger sizes until in effect the whole ball is covered with dust. However, the conclusions are tentative and the authors emphasize the need of much more study and research.

Developments which may follow greater knowledge of the subject include, the authors say, possibly more attention to higher quality grinding media—with wearing properties that are conducive to smooth-surfacing; research looking to the discovery of new reagents to aid grinding.

The paper is one which, doubtless, will receive much comment and discussion, for it opens up a subject that puzzles and intrigues many cement plant operators.

A sedimentation balance for measurement of size distribution of fine materials was described by FRED C. BOND, Allis-Chalmers Manufacturing Co. The author explained: "A large number of size-distribution determinations below 200-mesh were required in connection with a particular research problem in fine grinding. The sedimentation balance was used in this investigation, and a technique was gradually developed that ultimately gave good results."

Measurement of Size Distribution

The sedimentation balance is essentially a balance pan suspended in a liquid that contains falling particles. These are weighed as they settle on the pan, and the time rate of settling is determined. The size distribution is computed from the settling rate. The paper describes its use and the necessary calculations and formulas. A comparison was made between the surface area of a sample as computed by sedimentation-balance measurements and determinations with a Wagner turbidimeter, with results that, the author says, are in fair agreement. The paper contains data helpful to all interested in classification and determination of fine particle size by settling rates.

Flotation of Magnesite

The flotation process is constantly being extended in the rock products field. Every meeting of the Institute develops new information. This year a paper of much interest because it pioneers a new field was that by J. B. CLEMMER, H. A. DOERNER AND F. D. DE VANEY, on "Experimental Flotation of Washington Magnesite Ores." The magnesite ore as mined contains a considerable amount of impurities in the form of calcite or limestone, dolomite, talc, serpentine, quartz and shale.

The flotation process appears to be

(Continued on page 54)

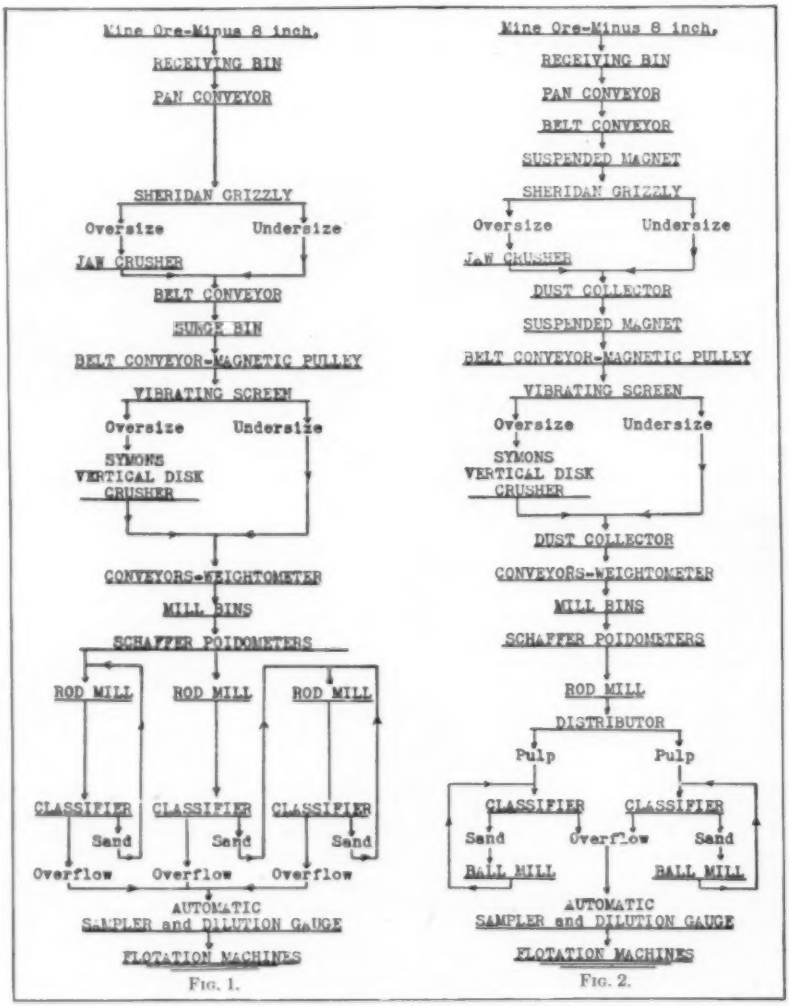


Fig. 1: Flow sheet of Tennessee Copper Co., before rearrangement of equipment, had production of 900 tons per day. Fig. 2: After rearrangement production increased to 1350 tons per day

Health In the Cement Industry

No serious dust hazard exists in the portland cement industry—is the conclusion of Saranac Laboratory survey*

SOME WRITERS have maintained that occupational exposure to dust of any kind increases susceptibility to infection and perhaps favors its transmission. The opinion has been frequently voiced that calcareous dusts tend to promote healing of tuberculous foci. There is too little knowledge of the influence of mixed dusts containing relatively small amounts of free silica upon susceptibility to tuberculous infection. In some industries, where such mixtures are produced, tuberculosis has been excessively frequent while in others it has not been an outstanding feature.

Data to be presented indicate that the incidence of tuberculosis and other pulmonary infections in this large group of persons exposed for long periods to the different cement plants' dusts is as low or lower than that in the general population, thus confirming the conclusions drawn by the U. S. Public Health Service in its study of employes in one plant. There is nothing to suggest that prolonged inhalation of pure cement dust has altered natural susceptibility to tuberculosis or that the free silica in the raw mill atmosphere has had any more effect upon tuberculous than upon normal lungs. Calcification has been commonly observed in the primary lesions, but as most of these were presumably acquired and healed before the time of occupational exposure, the influence of the dust is of questionable significance.

Primary Complex

In the absence of tuberculin surveys the prevalence of isolated calcified "primary foci" has been used as a rough index of tuberculous infection. Somewhat less than one-fourth of all these 2278 employes in the cement industry showed evidences of primary tuberculous infection that had subsequently healed to leave minute scars or foci of calcification. The incidence of such lesions increased steadily in each successive age group, rising from 17.59 percent for the men under 30 to 50 percent for those 70 years old and over. If one accepts with the writers the belief that such infections are usually acquired in childhood, the progressive increase in frequency in the older men would reflect the higher prevalence of tuberculosis throughout the country at the time when these older employes were children.

Taking chest X-rays with precision radiograph equipment for health survey

Old tuberculosis was diagnosed where localized string-like shadows of scar tissue with or without calcified foci occurred in the tops of the lungs or occasionally in other locations. In the entire group of 2278 employes of all ages, races, sex and conditions of employment, 3.78 percent show such roentgenographic patterns. Their incidence increases steadily with age from 0.76 percent for men under 30, to 30.77 percent for those 70 years old and over.

The influence of a racial factor, which had been anticipated as a cause of more infection in the southern plants, is not apparent. Probably this is due to elimination of infected members of these more susceptible races by pre-employment selection.

There is a surprising uniformity in the frequency of apical scars in persons living in different parts of the country. In all but three plants the percentages vary between 3.49 and 4.98. In the Kansas group it was a little higher, 5.69 percent, and in two others it was less, 0.8 percent for Missouri No. 2, and 1.64 percent for California No. 1. The average figure of 3.78 percent is appreciably lower than that reported for similar lesions discovered in examining younger candidates for military service in the World War (4.5 percent).

On distributing the findings on the plant men by duration of employment there is a steady increase in the percentage of old tuberculosis in each successive five-year period. It should not be inferred, however, that the increasing incidence of infection is the result of dust exposure for there was a similar rise in incidence of such infection in the control group. For all employes the percentage of old tuberculous infections was 0.09 percent higher than that in the group exposed to dust. Therefore it seems clear that factors other than increasing exposure to dust were responsible.

Active Tuberculous Lesions

These lesions were interpreted in films where *mottled* shadows occurred with or without the string-like ones characteristic of older disease. In the entire group of 2278 employes only four instances of active disease were discovered. The incidence of 0.18 percent is surprisingly low in comparison with the usual estimates of 1 to 1.51 percent for the population as a whole.

On classifying the four cases of active tuberculosis according to the *age* of the subjects it was found that all occurred in men over 40; three in the fifth decade and one in the seventh. The latter, an old Utah metal miner, is associated with silicosis, which presumably accounts for its appearance at this late age. Considered in relation to length of employment all four cases were in men

*This is the final article of the series on this important study. The report has been abstracted by A. J. R. Curtis, secretary, Committee on Accident Prevention and Insurance, Portland Cement Association.

Bag wheels with dust collectors. Relatively low concentrations of dust were found for this department

who had worked from 5 to 14 years inclusive. There was one among the 185 negroes and none in the Mexican group.

The above analysis of evidences of pulmonary tuberculosis indicates very definitely that prolonged exposure to moderately high concentrations of various cement plant dusts does not increase susceptibility to this infection. The combined incidence of all adult type tuberculous lesions, in both healed and active stage, is only 3.96 percent which is about one-third that reported for general population groups not exposed to dust.

Likewise the evidence indicates that prolonged inhalation of finished cement dust has no unfavorable influence upon the course of an established tuberculosis. If it has any effect such dust seems to have reduced the anticipated number of active infections. Whether it has favored calcification of healed lesions has not been definitely established. The mixed, silica-containing dusts of the raw mills have neither increased susceptibility to tuberculous infection nor unfavorably altered its course.

Non-Tuberculous Infections of the Lungs

Evidence of such lesions, found in less than 1 percent of the entire group, is no more common than in the general population. They occur at all ages and their incidence in different plants is extremely variable. The fact that all of them, when discovered, were completely healed indicates that the inhaled dusts had exerted no unfavorable influence upon their course. They, in turn, had apparently failed to influence the localization and resultant reaction to the inhaled dust, an outcome so common with dusts of high silica content. The healed pleurisies were likewise unaffected by any coexistent pneumoconiosis.

In the same category also belong eight cases of miliary calcification which are not indicated in the tabulations. Seven of these were found in the Indiana plant and one in Missouri No. 2. They are assumed by many to be healed foci of infection with an aspergillus acquired from contact with grain. They have no clinical significance and are in no way associated with exposure to cement dust. Meriwether and Sayers who gave the first detailed description of such lesions, reported an incidence of 0.6 percent among 18,285 lead and zinc miners.

Bronchitis and Acute Infections

In taking the medical histories, attention was given to bronchitis and other respiratory infections. There was a marked variation in the attack rate of bronchitis as well as other infections in cement workers in different parts of the country. These figures, based upon the statements of the men, may be subject to some error. Reports of low incidence in the dry sections of Texas and Kansas as contrasted with the high incidence in one of the dampest parts of New York state, suggest a marked climatic influence.

Variations in frequency of influenza, both epidemic and occasional, and of pneumonia were also undoubtedly modified by the general prevalence of such infection in each community.

General Summary

The survey showed that finished cement dust is often present in relatively high concentrations in the atmosphere of the finishing mills and packing departments but this dust contains practically no free silica. In the raw mills and associated crusher houses the air contains variable concentrations of dust ranging from 1 to 30 percent silica, and in a limited area in one plant, on occasion, as much as 60 percent free silica mixed with particles of limestone, shale, clay and other materials. Technical obstacles prevented exact determination of the proportion of atmospheric silica that was present in inhalable state. It was shown, however, that much of it is too large to cause danger. In the quarries or mines, blasting and loading operations produce dust, which in occasional cases may be high in free silica. The hazard in quarries is generally slight because the natural ventilation is good and the exposures are intermittent.

Of the total group of 2278 persons examined, 1979 were employed in the plants where they were exposed to dust of various kinds. The majority were white American males of slightly greater age distribution than in most industries. Exposures were generally prolonged; over 55 percent of the exposed group had worked in the cement industry more than 10 years and nearly a third of them for more than 15 years. Eighteen had been employed for more than 45 years. These figures definitely indicate an unusual employment stability.

An exact correlation between exposure to the dusts of different compositions and the pulmonary conditions has been impossible because so many of the employes have worked in several departments. Analysis indicates, however, that prolonged inhalation of dust from finished cement produces such slight anatomic reaction that little or no abnormality is seen in the roentgenogram. The mixed dusts of the raw mills, which contain free silica in varying amounts, are probably responsible for a limited number of cases of well-marked linear exaggeration, non-disabling in character.

Only two individuals exposed to sandstone dust in special operations showed nodulation resulting from their cement industry employment.

When compared with the dust hazards in hard rock mining and other silica industries, the problem in the cement industry is trivial. The total incidence of first-degree linear exaggeration in the films of the cement group (15.09 percent) was less than half that in a group of rock miners and for the second-degree, the frequency (2.40 percent) was about one-thirteenth. Only eight of the 2278 employes showed evidence of nodular fibrosis attributable to dust. In six of these, exposure to silica dust in previous employment was presumably responsible. Two unusual cases (P_3) were also discovered in which infection, possibly associated with inhaled dust of some sort, was responsible for the roentgenographic patterns.

The incidence of tuberculosis and other chronic infections of the lungs was found to be less than that in the general population. The manifestations of tuberculosis occurred in typical form and at the same age periods as in persons not exposed to dust by occupation. It is concluded that prolonged inhalation of cement dust has no unfavorable influence upon susceptibility to tuberculous infection or upon its subsequent evolution.

Determining CO_2 By Gas Volume

Samples of calcareous material are heated with mixture of sulphuric acid and potassium bisulphate. This mixture assures greater accuracy than the use of volatile acids

A SIMPLE AND RAPID METHOD of determining CO_2 on small quantities of material with an accuracy of $\pm$ 0.2 milligram has been developed by G. E. Bessey.* The method involves a direct volume determination of the gas evolved on heating the material with a mixture of potassium sulphate and sulphuric acid. Its use is limited to materials which do not liberate any gas other than CO_2 or water vapor on heating with sulphuric acid. Limes, limestone, portland cement, sand-lime bricks and similar materials come within this limitation.

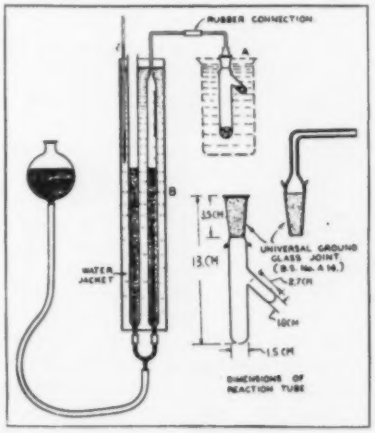
Other methods employing hydrochloric or other volatile acids for a displacing agent introduce sources of error due to the formation of acid vapor and water vapor, and the solubility carbon dioxide in the liquids. With the Bessey method, the sample of calcareous material is heated with a mixture of sulphuric acid and potassium sulphate, giving a mixture of potassium bisulphate with excess of sulphuric acid. This mixture fuses readily, has a high boiling point and breaks down any calcareous sample containing carbonates, and solidifies on cooling without dissolving any measurable amount of CO_2; it also has a strong affinity for water and absorbs any water vapor given off by the sample during the heating period.

Apparatus and Procedure

The following description of apparatus and procedure applies to samples containing not more than 0.015 g. of CO_2; that is, 0.2-0.3g. would be taken of a sample containing not more than 5 percent of carbon dioxide. Apparatus used is shown in the accompanying illustration. Test tube A, surrounded by a water-bath, is used as a reaction tube. It is fitted with a small side tube of about 1.5 ml. capacity fused on at about one inch from the top and at an angle of about 45 deg. from the axis of the test tube. The outlet has a ground-glass stopper having a capillary tube bent at right angles and connected by a flexible rubber tube with the measuring apparatus B.

The measuring tube consists of a 10 ml. pipette subdivided in 1/10 ml., fused at the bottom to a length of tube of similar diameter, which with it is fitted in a water-jacket, and at the top to a capillary bent at right angles.

The weighed sample is introduced into the reaction tube and 1.5 g. of potassium sulphate added; 1.2 ml. of sulphuric acid is introduced into the side tube by means of a pipette having a suitably bent tip. The mercury in the measuring apparatus is raised to near the zero mark, and the reaction tube fixed in place; the stopper should be moistened with a drop of sulphuric acid. The water-bath is then placed around A and its temperature adjusted to the same temperature as the water-jacket around B.



Apparatus used to determine CO_2 by gas volume

After allowing 10 to 15 minutes for temperatures to become uniform, the pressure is balanced and the volume of the gas read. The water-bath around A is then removed, the tube tilted to run the sulphuric acid into the main tube, and the bottom of the reaction tube gently warmed. Pressure in B should be kept roughly balanced with atmospheric pressure during the determination. The reaction of the sulphuric acid with the carbonate usually proceeds without much warming, but to ensure complete decomposition of the sample, the tube is heated carefully until it is completely fluid or pasty and there is no further evolution of gas on removing the flame.

Ebullition of the fluid should be avoided as far as possible; it is usually possible to observe whether overheating has occurred above the stop-

*This method was developed and the studies carried out by the Department of Scientific and Industrial Research, Building Research Board, Great Britain.

CHEMIST'S CORNER

Problems and practices of the chemists in the industry are discussed on these pages. Contributions and comments are inited.

CARBONATE (CO_2) CONTENTS BY GAS VOLUME METHOD

Sample	Weight taken	CO_2 found		CO_2 calc. or found by standard methods	
	g.	g.	%	g.	%
Calcium carbonate.....	0.0215	0.0094	43.7	0.0095	44.0
Calcium carbonate.....	0.0352	0.0156	44.3	0.0155	44.0
Calcium hydroxide	0.226	0.0033	1.4	0.0032	1.4
(H) Calcium silicate...	0.195	0.0029	1.5	0.0029	1.5
(H) Calcium aluminate	0.204	0.0122	6.0	0.0126	6.2
	0.182	0.0109	6.0	0.0113	
Sand-lime brick	0.324	0.0023	0.7	0.0025	0.8
	0.264	0.0019	0.7	0.0021	
Portland cement, 1.....	0.264	0.0029	1.1	0.0029	1.1
Portland cement, 2.....	0.304	0.0022	0.7	0.0018	0.6
(H) Portland cement, 1	0.210	0.0065	3.1	0.0065	3.1
	0.258	0.0075	2.9	0.0080	
(H) Portland cement, 2	0.201	0.0101	5.0	0.0101	5.0
(H) Portland cement, 3	0.200	0.0025	1.2	0.0023	1.1

(H) indicates Hydrated.

per. The tube should be allowed to cool until it can be held in the hand and the water-bath placed round it. The temperature of this bath is then again adjusted to that of the water-jacket around B, and 10 to 15 minutes again allowed for temperatures to become uniform. The pressure is adjusted, the final volume read, and the weight of gas evolved calculated, taking the density of carbon dioxide as 1.977 g. per litre at 0 deg. C. and 760 mm. pressure. The aqueous vapor pressure in the presence of concentrated sulphuric acid is low and can be ignored.

When there is any doubt regarding the completion of the reaction, or if it is desired to check the result, the reaction tube may be reheated after taking the volume reading and a further reading taken on cooling.

The total time required for a determination is about one hour, without allowance for reheating as above.

The approximate total gas volume of the apparatus needs to be known for correcting the readings for any temperature change in the surrounding water-baths during the determination. For the apparatus used in the present work it was about 30 ml.; the correction for 1 deg. change in temperature applied to the final volume reading was, therefore, about 0.10 ml. The total volume can be determined with sufficient accuracy by reading the pressure at two different volume readings in the gas pipette.

The potassium sulphate and sulphuric acid used must be of the highest purity and a blank determination should be run with these reagents alone. Different samples have been found to give different blanks, varying from 0.0001 to 0.0006 g. The blanks are, however, quite constant for any one batch of reagents; they are probably due mainly to small amounts of organic fibre, etc., in the potassium sulphate.

Accuracy and Applicability

Determinations have been carried out on pure calcium carbonate and on various materials with carbonate contents checked by other standard methods. Some results are shown in the appended table.

The method is not applicable to aluminous cement, slag cements, or slag, owing to the presence of ferrous iron or sulphides; it is also inapplicable to minerals or other materials containing organic matter, ferrous iron, other reducing agents, sulphides, or other compounds liberating gases when heated with acid under the conditions of the determination.

Slag and Gypsum Cements

By DR. FREDERICK O. ANDEREGG
Contributing Editor, Newark, Ohio

ONE OF THE MOST interesting developments of the past few years in Europe has been in slag cements using gypsum (or anhydrite) as accelerator, together with a little lime or portland cement.

Extensive experiments have been reported by L. Blondiau, of a Belgian cement company, in 14 installments in *Rev. des materiaux de construction*, Nov., 1938 through Dec., 1939, Nos. 350-362. Initial set with Vicat needle runs from 2:20 to 4:00 and final set from 4:30 to 6:50. The soundness tests give excellent results and these cements yield concretes which exert notable resistance to sulfate solutions, having the same strengths after storage in such solutions as in water, even after several years of contact. Humic acid, sea water, linseed and other oils have little effect.

Fine Grinding Required

Cement tested has been ground very fine, having a specific surface in the Wagner apparatus of 3360 sq. cm. per gram. The result is a very dense paste that lets little water penetrate. The action of the gypsum is supposed to be with some of the lime and all of the alumina set free from the slag. The result is the formation of compounds having a great deal of water of hydration, so that much of the mixing water is used up; in fact, care must be taken that the concrete does not lose water early in the game. This material seems to be capable of preventing rusting of reinforcement, as shown by breaking away the concrete protecting steel after five years immersion in corrosive solutions. The modulus of elasticity of these slag concretes is greater than for portland cement concrete, especially at early ages.

Blondiau's results might seem to be the exaggerations of a manufacturer, but they have been confirmed by the eminent French concrete expert, R. Feret, of the French Highway and Bridge Laboratory. He has reported his experiences in the same journal, 1939, Jan. through Aug., Nos. 352-359. Feret made a large collection of different slags, having from 42 to 48 percent lime, ground them with a large number of potential accelerators, and tested them in a great variety of ways. The strength generally increases with increase in lime-silica ratio, but the rate of cooling, as affecting the mineralogical content, has to be considered. Portland cement alone or with a little sodium sulfate or calcium chloride gave favorable 28 day strengths, but on exposing to sulfate solutions, it would only be a question of time, until trouble would be experienced.

Slags Like Hydraulic Cements

A "sursulfate" cement, similar to that described by Blondiau, containing 81 percent slag, 4 percent portland cement and 15 percent anhydrite gave best results, although some of the slags did not do quite so well as others. For instance, 28 tensions were reported running from 468 to 552 p.s.i., while the compressives ranged from 3570 to 7100 p.s.i. Fairly good results were obtained with 4.5 percent gypsum and 0.5 of fat lime.

Chemical tests were run and Feret decided that slags behave much more like hydraulic cements than like pozzuolanas. Shaking slag with lime water yields little information. A very convenient way to test slags has been evolved. Gage a 1:2 mix with French standard sand, using 11 percent on the mix of a caustic soda solution, containing 200 grams per liter and store under a bell jar in a CO_2 free atmosphere. It is very valuable to place such a mixture in a calorimeter and note the rate of heat evolution, from which an idea can be obtained as to the suitable degree of fineness to which the slag cement should be ground.

New Cements Adaptable for Mass Concrete

Further corroboration is given by a German authority on cement, Richard Grün, reporting in *Tonind Ztg.* (1939) 63, No. 91, p. 940; No. 92, p. 946, with R. Tremeyer, of good results obtained by grinding slag and gypsum. They think the slag should be low in manganese, but fairly high in alumina. The low heat of hydration makes such a cement very useful in mass concrete, but they warn against letting this concrete dry out at early ages. Since the cement contains no susceptible portland clinker, it is almost invulnerable to sulfate attack.

Individual Gas Producers

Lime kilns with individual gas producers have been developed to high state of efficiency for both large and small plants

By VICTOR J. AZBE

OVER 25 YEARS AGO, E. Schmatolla, the German kiln designer was invited to this country and entered the employment of Wm. E. Carson, Riverton, Va. He later built a series of kilns for other American lime manufacturers, all of which were equipped with individual gas producers.

Colonel Cobb's plant at Glen Park was of his design and installation, and for those days was considered not only novel but quite successful. Schmatolla was a very good designer, quite original and in many respects, far ahead of his time. He did much for the lime industry although he now is either forgotten or given little credit. But, as we look back, there must have been very few that understood either him or his kilns. It never was the writer's pleasure to know him personally, but never-theless, he became sort of intimately acquainted with him because it was an education to work about and study Schmatolla's Glen Park kilns that contained many basic principles essential to good kiln performance which, at that time and often even today, are violated in kiln designs and operation.

His kilns were usually deceptively simple in appearance but actually quite scientific in principle, and as few understood these governing principles, it was usually Schmattolla only that was able to get the most out of the equipment. When the operators had trouble and Schmatolla was called in, probably all that he would do, would be to close the damper on the kiln top slightly and matters would be straightened out immediately. But while few knew it, he by that one act put the lime cooler, the gas producer and the kiln in balance with each other.

LIME FORUM

Mr. Azbe is a contributing and consulting editor of ROCK PRODUCTS. He will be glad to receive inquiries from his readers, and will answer these direct or through the columns of this Forum.

His Glen Park kilns had a closed top and a chimney equipped with a damper, and he used this damper to choke the kilns as one would damper a boiler which, for kilns, is unheard of today.

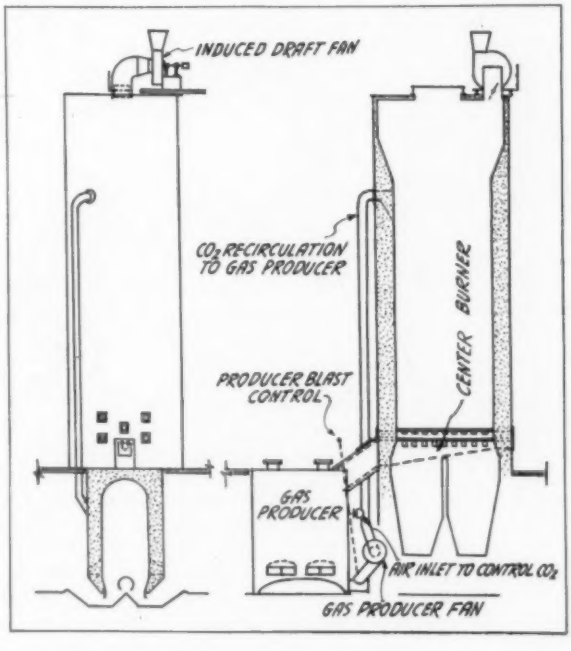
Although the kilns were very small in cross-section, only about 37 sq. ft. of shaft area, they produced 22 tons of lime per day without any sort of kiln fan or producer blowers.

This is a better capacity by far than of any other natural draft kiln we ever heard of. Fuel ratio was also good, and the kilns, although intermittently hand-fired, made no smoke at all. There was only one trouble, combustion conditions were so good that temperatures were too high. As a result, kiln repair costs were large since at that time not as much was known about temperature control.

Kilns were equipped with a very deep lime cooler and even deeper producers. Through this height, the cooler conferred considerable forced draft effect on the air and the producer gas also entered with a great deal of pressure.

Producers were not blown; they were strictly of natural draft type, but their gasification rate was very low, only about 7 lbs. of coal for each square foot of producer area for each hour. Ordinarily no steam or CO_2 was used, and the ashes were allowed to clinker and were removed through suitable large openings.

These producers gave an exceedingly good gas, better than any the writer ever tested on any other installation, CO_2 about 1.5 percent, CO as high as 31 percent. The gas was cold, below or about 800 deg. F. temperature, and it was cool to the point of darkness but not so cold as to cause any tar trouble in the very short connections to the kiln. There was not much soot trouble either.



Deep fuel bed gas producer applied to lime kiln

Bricklayer Is Not a Lime Kiln Engineer

As with anything good, there was much copying. A plant was installed at Manitou, Colorado by the bricklayer who built the Glen Park kilns, but this plant proved a complete failure. The man may have been a

good bricklayer and probably considered himself a good lime kiln engineer, but as a result of this failure the secret of proper cooler and producer heights failed to be transmitted. Through this error, the Manitou kilns instead of representing the best of their type proved about the worst of any type, with a production of only about six tons of lime per kiln.

About twenty St. Genevieve kilns were also equipped with individual producers but they all had small boxes of low height, and were forced by being heavily blown with steam. In some places, the fuel bed was too thick and at the edges the live coal tapered down to bare ashes. Much of the gas produced was burned right in the producer by the air coming in through the bare places of the bed. The gas was very hot, over 2000 deg. F. and its analysis very poor with CO_2, 12 percent and CO only 10 percent. While Glen Park kilns rarely ever smoked, at St. Genevieve the smoke was extremely dense and the kiln ratio very poor.

While in a well operated automatic producer about 13 percent of the carbon in the coal is converted to CO_2 rather than the desirable CO, in these St. Genevieve semi-gas producers, the conversion was about 40 percent and by contrast in the Glen Park deep fuel, slow gasifying producer, only about 4 percent.

Objection to the Glen Park installation was the great bulk of its producers; to St. Genevieve, their smallness and shallowness, as well as the uneven fuel bed which at the edges was too thin for satisfactory production of good gas. It always seemed that some compromise could be established, and a gas producer evolved that could be cheaply applied to kilns in which coal would be satisfactorily gasified. Such a producer would be a boon to the industry as all plants could not afford expensive centralized gas producer equipment, and direct-firing is too expensive and crude for present day operation.

Application to Small Kilns

Such producers also could be applied to small kilns in small plants that cannot well afford greater elaborations. Through it all, the fundamental idea was kept in mind that if the fuel bed is thick and solid, with no bare spots, it is impossible to make anything but good gas. There also was the desire to connect such a producer with the well-developed center burner.

An opportunity was later offered to work out something like this for a remotely located plant in Canada; an installation which has proved quite a success. It consists of a new kiln, and one steel-jacketed, company-constructed gas producer. The installation is very similar to that shown in the illustration, except that in addition to the center burner, there also were side burners. However, the side burners were intended to be used only when necessary and not continuously.

Results are very good and the kiln produced 43 tons of high calcium lime per day, with this capacity gradually increasing and tending towards 50 tons. Fuel ratio for an entire month was 5.3 to 1 which includes the loss due to week-end shutdowns. Quality of gas produced was very high as CO_2 content was only 3 percent, and that is better performance than any automatic producer.

It may be considered particularly good as the producer blast had 5 percent CO_2 due to introduction of some spent kiln gases to avoid clinkering. Actually all carbon in the coal and even some CO_2 from the blast was converted into combustible CO.

The producer had a fuel bed area of 40 sq. ft., therefore gasification rate was about 15 lbs. of coal per square foot per hour. Producer area corresponds closely to kiln capacity, and as the producer was definitely the bottle-neck of the installation, if its area were 50 sq. ft., then fifty tons of lime would have been produced by the 65 sq. ft. kiln.

Producers related to this type ordinarily were called "Semi Gas Producers;" why, the writer does not know. There certainly is nothing "semi" about their gas quality. Therefore, the name was changed and from now on we suggest they be called "Deep Fuel Bed Producers." When the design is right, live fuel bed thicknesses of three and even four feet are possible, as the formation of thin spots is unlikely and the highest grade gas is assured.

In the Canadian installation, a kiln exhaust and producer blast fan were used because it was planned for high capacity operation. However, when demands are more modest and the kiln is proportioned in width of shaft to lower capacity, the same scheme, modified, would work on natural draft as it did work at Glen Park, and it would be a great improvement over a direct fired kiln with any solid fuel, either coal or wood.

A.I.M.M.E. . Annual Meeting

(Continued from page 48)

applicable to the separation of these minerals from the magnesite to give it sufficient purity for use in refractories. Most interesting to rock products producers because of its very broad significance was this statement of the authors: "The low-grade mine rejects, which contained both siliceous minerals and carbonates (limestone and dolomite) were treated by two-stage flotation procedure. First the siliceous minerals, and unexpectedly, calcite were floated, using cationic-type collectors; then the magnesite was floated from the dolomite by the usual soap-flotation methods."

Economics

A session of the meeting was devoted to the economics of the industrial minerals. Papers included one by W. M. Weigel, mineral technologist, Missouri Pacific R. R., on transportation. He gave instances of long hauls for these low priced commodities—glass sand moves from Missouri to Mexico, with a freight rate four times the plant price; and stone (rip-rap) has moved as far as 400 miles by rail for Gulf coast jetty work.

The "Optimum Size of Plant" was discussed by Dr. Oliver Bowles, U. S. Bureau of Mines, basing his conclusions largely on a recent study of the lime industry, 1910-1938 (I.C. 7088). He pointed out that while the output of the large plants had fluctuated widely through the years, and the very small plants had been practically eliminated, the medium-sized plant (10,000 to 50,000 tons annual capacity) had a much more consistent record; and plants in this classification accounted for 40 percent of the total production.

Pricing policies, or rather the lack of pricing policies or philosophy, were discussed by the writer (editor of Rock Products). This discussion does not contain much that is new to producers, but it emphasized the struggle for volume in order to reduce unit costs, and how this fierce competition tends to keep prices at a minimum. The conclusion was that some legal way must be found for producers to discuss prices or price policies or price philosophy in order to come to some common understanding of what constitutes a fair price, and how to arrive at it for the benefit of producer and consumer alike. Too much effort is being wasted now to take volume away from competitors, who must retain it for self-preservation, instead of constructive promotion to widen or expand markets.

Association Will Stick To Sand-Lime Brick

By NATHAN C. ROCKWOOD

A LARGE MAJORITY of the members of the Sand-Lime Brick Association are now making concrete brick and block, using the same process and equipment as for the manufacture of sand-lime brick—that is high pressure steam curing. Yet, for many reasons, business as well as sentimental, it was decided at the annual convention in New York City, February 12 and 13, not to expand the association to include concrete products so made. This would have meant, probably, a change in the name of the association, which is one of the oldest in the building materials field.

Form New Association

After the Sand-Lime Brick Association adjourned, the same manufacturers met to initiate the organization of a new and closely associated national association to include all genuine high pressure steam cured concrete products manufacturers. The name of the new association has not been chosen, but it is proposed to have a distinguishing trademark and to limit membership to manufacturers who conform to a specification which will insure a genuine high pressure steam cured product.

Harold J. Levine, past-president of the Sand-Lime Brick Association, president of the National Brick Co., Long Island City, N. Y., was elected president of the new association, and J. Morley Zander, secretary-treasurer of the Sand-Lime Brick Association, and manager of the Saginaw Brick Co., Saginaw, Mich., was elected secretary-treasurer of the new association, as well as of the Sand-Lime Brick Association.

Officers Elected

Chester A. Perkins, Northern Indiana Brick Co., Mishawaka, Ind., was elected president of the Sand-Lime Brick Association. J. C. R. Felker, of the Missouri Hardstone Brick & Tile Co., who was elected president a year ago, is no longer active in the sand-lime brick industry. In his absence Harold J. Levine, presided at the New York meeting. W. A. Smythe, York Sandstone Brick Co., Toronto, Ont., was reëlected vice-president. The executive committee in addition to the officers mentioned (including J. Morley Zander, secretary-treasurer) is comprised of C. H. Carmichael, Philadelphia, Penn., C. G. Miller, St. Louis, Mo., and Harold J. Levine, New York City.

Informal Conference

Most of the two-day meeting consisted of an informal round-table discussion of operating and sales problems. In spite of the fact that all except two or three of the manufacturers are also in the concrete products business, sand-lime brick is still the big end of their business; and it would appear that there are lively prospects of a return to the use of brick in building. While concrete block and tile have been extensively used on many new large scale housing projects for back-up of brick walls, experience has demonstrated more tendency to leakage than in the case of solid brick walls.

It appears that 1939 was the best year the industry has had in a decade and that prospects for 1940 are bright. There is a present tendency toward larger masonry building units, which means a demand for sand-lime block and concrete block, but union masons are beginning to take note of this and apparently are determined to limit the size or weight of the blocks they will lay up. Since the saving in labor cost is the chief reason for using the larger units, this means that there is likely to be a return to brick, which masons prefer to lay.

K. VAN DYK, son of a prominent sand-lime brick manufacturer in Holland, temporarily in this country to study the industry, described the sand-lime brick business of Switzerland and of Holland. Apparently they pay more attention to proper sand grading abroad. In Switzerland a light-weight sand-lime brick or block is made by including a little aluminum powder in the mixture. The reaction with lime is to make the mixture rise like bread dough to form a porous tile, much used in building partitions.

In Holland, Mr. van Dyk said, land is so expensive that every square foot has to be utilized to the utmost; hence the manufacturing process is speeded up, steam curing being done in three stages, with the same steam. The sand-lime brick are never used for exposed surfaces, but have a considerable market for interiors. There are

Chester A. Perkins, new president of the Sand-Lime Brick Association

17 sand-lime brick plants active in Holland, making about 70,000,000 brick a year. Labor cost, of course, is much lower, and the brick sell for as little as $4 per thousand.

Elements of Masonry

Prof. Walter C. Voss, Massachusetts Institute of Technology, discussed the whole subject of masonry wall construction, much as he has done on several occasions for the National Lime Association and for groups of architects and engineers in various cities throughout the country. He emphasized that solid brick walls were more weather-proof than those backed up with hollow units. He said if the hollow units were used they should be laid up first and the brick face laid against them. Prof. Voss also said that high pressure steam curing was not a guarantee against shrinkage of concrete masonry units, although it helped. The main thing was that all such units should be delivered to the job thoroughly dried out.

Sand-lime brick, well made, Prof. Voss said, has some advantage over clay brick in that it is homegeneous and its absorption can be controlled. Great strength in masonry units is not necessary, he said; also that the calcium silicate bond in sand-lime brick is the most permenent cement in nature.

Prof. Voss concluded his talk by warning all building material manufacturers that architects are planning to establish a coöperative inspection and research service which will pass on the claims of manufacturers and broadcast its findings to architects everywhere. Their project includes inspection of all buildings erected within the last five years.

Hints and Helps

★ FOR SUPERINTENDENTS ★

Spring Switch For Safe Blasting

By ROSS WHEELTON

AT A SMALL QUARRY known to the writer a blasting machine was not available for detonating electric

Switch box for blasting detonator has spring on switch to assure open circuit after use

blasting caps. To serve this purpose, two leads were taken from the high voltage power supply and run through a switch box to the blasting leads. This worked well regarding the efficient detonation of the charge, but there was always the possibility of the blaster neglecting to throw the switch OFF immediately after firing the charge.

If the switch were left ON a severe electric shock might be received by one of the workmen accidentally touching one of the lead wires and completing the circuit to ground.

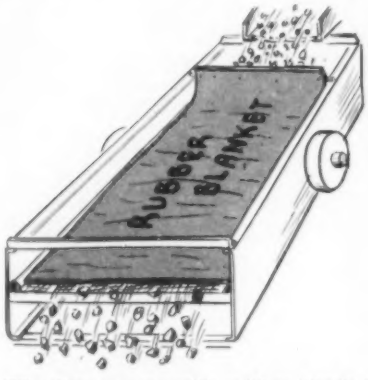
When this danger was seen by the quarry foreman he had a strong spring fitted to the switch handle as shown in the illustration. This spring allows the switch to be turned ON but prevents it being left there, because as soon as the hand is removed from the handle it is returned to the OFF position by the spring.

The spring should be strong enough to return the handle without fail, and it is best to spread the contacts in the box so that the switch knives do not grip too tightly, because perfect contact is not necessary in this work where the circuit is only closed momentarily.

If a blasting machine is available by all means use it, but where leads are taken from the power supply as they are in so many cases, the switch should be equipped with a spring to prevent it being left on after use.

Exceptionally Accurate Screening

NECESSITY for proper feeding of screens to get screening efficiency, as described elsewhere in this issue by Royal E. Fowle, brings to mind an expedient resorted to by Irving Warner, vice-president and chief engineer of the Warner Co., Philadelphia, Penn., as related by him to a small



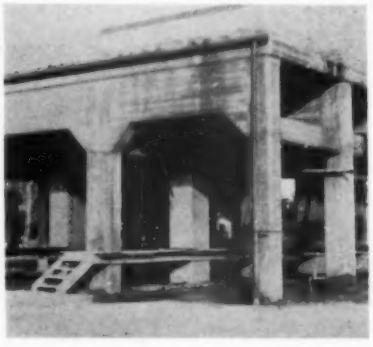
Vibrating screen with rubber blanket over screen surface

group of producers a little while back.

The thing that causes inefficient screening is the rolling or bounding over the screen surface of pebbles or pieces that should go through. Mr. Fowle describes methods of reducing the velocity of pebbles. He probably did not know of the ingenious method thought out and tried by Mr. Warner, who merely spread a rubber blanket over the screen surface. The upper end of the rubber blanket was lifted enough to let the material flow under it. The material to be screened then had to wiggle down under the rubber blanket like mice under a rug. It worked, and gave extremely accurate sizing for a very special specification.

Walkways Under Bins

SATICOY ROCK CO., Ventura, Calif., at its new plant near El Rio, has built walkways under the bins to make the truck drivers' work easier. The walkways are just the height of a truck running-board so that the driver can step out on to them



Walkways alongside driveways under bins are a convenience for drivers

quickly to operate the bin gate levers. In this way he avoids walking in water that may accumulate under the bins.

Removing Clay Balls From Stone

BELMONT TRAP ROCK CO., INC., Staunton, Va., operating a dry limestone screening plant, solved quite simply the problem of removing clay balls from stone.

Stone coated with clay is easily detected in the quarry and in its travel through the plant. Such stone is removed from the bins by truck, and hauled a short distance to a small auxiliary plant. Here, the stone is spread out in a row to dry.

Above: Small auxiliary plant for handling stone after clay balls have dried out in sun. Below: Dried out stone reclaimed by horse-drawn scrapers

After sufficient exposure to the elements, the stone is reclaimed by horse-drawn scraper to a hopper feeding a 12- x 18-in. double-roll Buchanan crusher in the auxiliary plant. The process is repeated, the next layer of stone usually being sufficiently "baked" to be handled as soon as the first scraper depth is removed. In the process of passing through the crusher, the clay is readily dislodged.

The crusher discharge is elevated over a bucket elevator, 20-ft. centers, to a 3- x 6-ft. double deck vibrating screen, where the stone is re-sized. Dust passing through the 3/16-in. lower-deck openings is recovered in a bin and sold.

Protective guard to prevent boulders from bouncing off belt where men might be hit

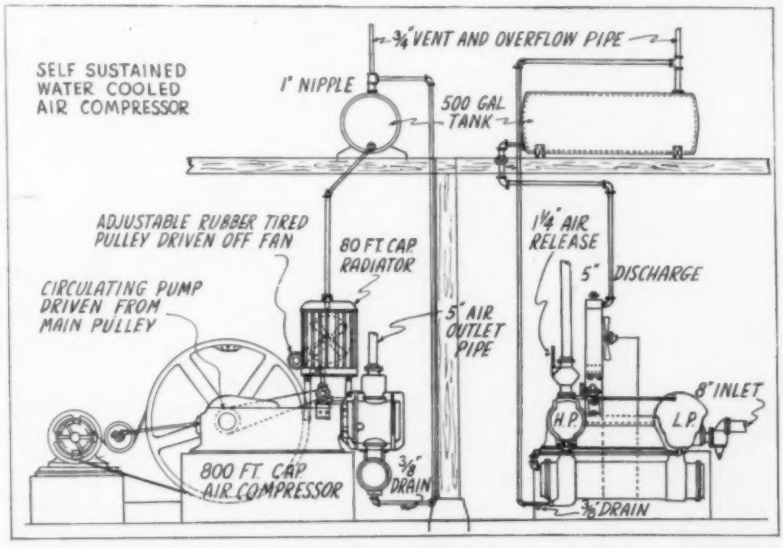
Recovering Cooling Water for Compressor

By CLARK H. WRIGHT

VERY OFTEN it is necessary to erect an air compressor where there is not a very large supply of water, especially when opening up a new stone crushing plant. To secure water from an outside source of supply, such as a city water hydrant, would require a large expenditure of money for pipe and fittings, and would involve the trouble of getting permission to lay the pipe over the property of others. And last but not least, a continuous supply of water costs money.

In the illustration is shown how this difficulty may be overcome at relatively small expense. Nearly every stone crushing plant has a 500-gal. tank or smaller that would answer the purpose of a supply tank. A truck radiator and circulating pump also may be easily secured and installed by a handy man around the plant. Once the system is filled with water, the expense of supplying cooling water to the compressor is eliminated. The water merely recirculates back into the system and is reused.

This arrangement is in many respects more reliable than dependence placed on the city water systems.



Sketch of re-circulating water cooling system for air compressor at stone plant

Guard Against Falling Boulders

AT ITS ARCADIA, Calif., plant, Blue Diamond Corp., Los Angeles, handles pit run material containing some rounded boulders up an incline belt conveyor for crushing at the plant. To guard against possible injury to employes from rolling boulders which might fall on the side walkway a permanent guard of steel pipe has been installed as illustrated. The pipe is rigidly supported and serves to guide boulders back toward the center of the belt for a distance down near the foot of the incline.

Drill Hole Size Tests

WHAT IS THE MOST ECONOMICAL and efficient well drill hole size for quarry blasting? At least part of the answer to this question was made by C. E. Blee, T.V.A. project engineer for Hiwassee dam in a recent issue of *Engineering News-Record*.

The T.V.A. in its quarry experimented with well drills producing a hole 9 in. in diameter for blasting. It was not certain whether 6-in. or 9-in. holes would give the best overall economy and it was, therefore, decided to experiment with both sizes.

Tests of both sizes indicated that the 9-in. hole was the more economical, and as a result this size was adopted as standard. Drilling speed was as fast with the 9-in. hole as with the 6-in., the greater weight of the string of tools compensating for the greater area of cutting. The average rate of drilling the 9-in. holes, including moving time, was 3.7 ft. per hour.

Holes were loaded solid with powder and the amount of rock produced per foot of hole was almost directly proportional to the area of the hole, the 9-in. hole blasting producing more than twice the amount of rock that a 6-in. hole would produce. In view of this result, the 9-in. spacing of the holes could be increased. Normal spacing, where shooting was parallel to the grain of the rock, was 45 ft. of holes with 24-ft. burden (distance back from the face). One row of holes was shot at a time. The reduced number of drill set-ups was responsible for a substantial reduction in costs. Fragmentation of the greywacke rock was as good with the 9-in. as it was with the 6-in. holes.

NEWS ABOUT PEOPLE

RALPH E. ROSCOE, vice-president in charge of chemical engineering of the Bessemer Limestone & Cement Co., Youngstown, Ohio, has been elected vice-president in charge of operations; Harry G. Hinson, has been elected assistant secretary and assistant treasurer; and Harry E. Reed, formerly assistant superintendent, has been appointed general superintendent. Mr. Roscoe succeeds the late DeWitt Clinton McKee.

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HARRY R. HAYES has been selected engineering director and secretary of the New York State Crushed Stone Association to succeed Elwood T. Nettleton. He has had experience in general engineering, contracting, consulting engineering, and directing various New York State trade associations. For ten years he was manager of the New York State Contractors Association and was organizer and first president of the New York State Association of City and Village Engineers.

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W. E. FARRELL, president of the Easton Car & Construction Co., Easton, Penn., was honored February 7 with a 70th anniversary dinner at the Northampton Country Club.

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JOHN O'CALLAGHAN has been appointed superintendent in charge of the Lone Star Cement Corp. at Bonner Springs, Kan., to succeed W. W. Deadman who was transferred to the Norfolk, Va., plant as superintendent. Mr. Deadman succeeds C. J. Lofstedt who is now general superintendent in charge of Lone Star Cement Corp.'s operations in Argentine and Uruguay.

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RALPH MORDEN, formerly in charge of the order department of the Marble Cliff Quarries Co., Columbus, Ohio, and an assistant to the late Paul C. Hodges, vice-president of the company, has been named as traffic manager. He has been associated with the quarry industry at Marble Cliff for more than 25 years. His early years were spent at the quarry.

EARL C. ANDREWS, who for many years has represented Lehigh Lime Co. in the midwest territory, joined the Marble Cliff Quarries Co., January 1, 1940.

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AN INTERESTED VISITOR at the recent convention of the National Concrete Masonry Association held in Washington, D. C., was K. Van Dyk. Mr. Van Dyk is associated with the sand-lime brick firm, Dordrecht Fuma, Van Dyk and Co., Kalkfabrick, Netherlands. He is making a tour of the United States as a vacation and to inspect various plants in the rock products industries.

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WILLIAM MELVIN WEIGEL, mineral technologist of the Missouri Pacific Railroad, has been elected chairman of the Industrial Minerals Division of the A. I. M. M. I. for 1940. He has had a wide range of experience as an engineer, technologist and author.

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M. L. JACOBS has been elected vice-president of Bethlehem Steel Co. in charge of raw materials, succeeding C. A. Buck, who will continue as vice-president and as a director, serving in a consulting and advisory capacity. Mr. Jacobs joined the company in 1916, four years later was made manager of quarries of Bethlehem Mines Corp., and in 1934 was appointed general manager of quarries of Bethlehem Steel Co. Last September he became assistant to Mr. Buck.

M. L. Jacobs

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Richard A. Froelinger has been elected executive vice-president and treasurer of the Arundel Corp., Baltimore, Md. Four other vice-presidents were elected. They are C. Warren Black, vice-president in charge of engineering and construction; Joseph G. Kuhn, vice-president in charge of dredging; George H. Bacot, vice-president in charge of materials production; and John A. Reilly, vice-president in charge of New York and New England areas. Mr. Froelinger resigned from the office of secretary which he held in conjunction with the treasurership for many years. He has been succeeded by Joseph N. Seifert as secretary, who retains his position as assistant treasurer.

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WALTER GEIST, vice-president of Allis-Chalmers Manufacturing Co., Dr. W. M. White, manager and chief engineer of the company's hydraulic department and R. C. Newhouse, chief engineer of the company's crushing and cement division have been awarded the National Association of Manufacturers special award, each as being one of this country's "Modern Pioneers." Other men known to the industry presented with the N.A.M.'s "Modern Pioneers" award were John Van Nostrand Dorr, president of Dorr Co. and associated companies here and abroad; Harry H. Barber, president and chief designer, Barber-Greene Co.; Carlisle K. Roos, director of research and development, United States Gypsum Co.; and Frederick Duwaine Wilson, chief engineer, Austin-Western Co.

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E. J. GOES, advertising manager of Koehring Co., Milwaukee, Wis., is co-chairman in charge of promotion of a regional conference for industrial advertisers to be held by the National Industrial Advertisers Association in Chicago, April 19. Milo E. Smith, advertising manager of the Chicago Bridge & Iron Co., Chicago, Ill., is program chairman and Harry Neal Baum, advertising manager of Fairbanks, Morse & Co., Chicago, is also a member of the arrangements committee.

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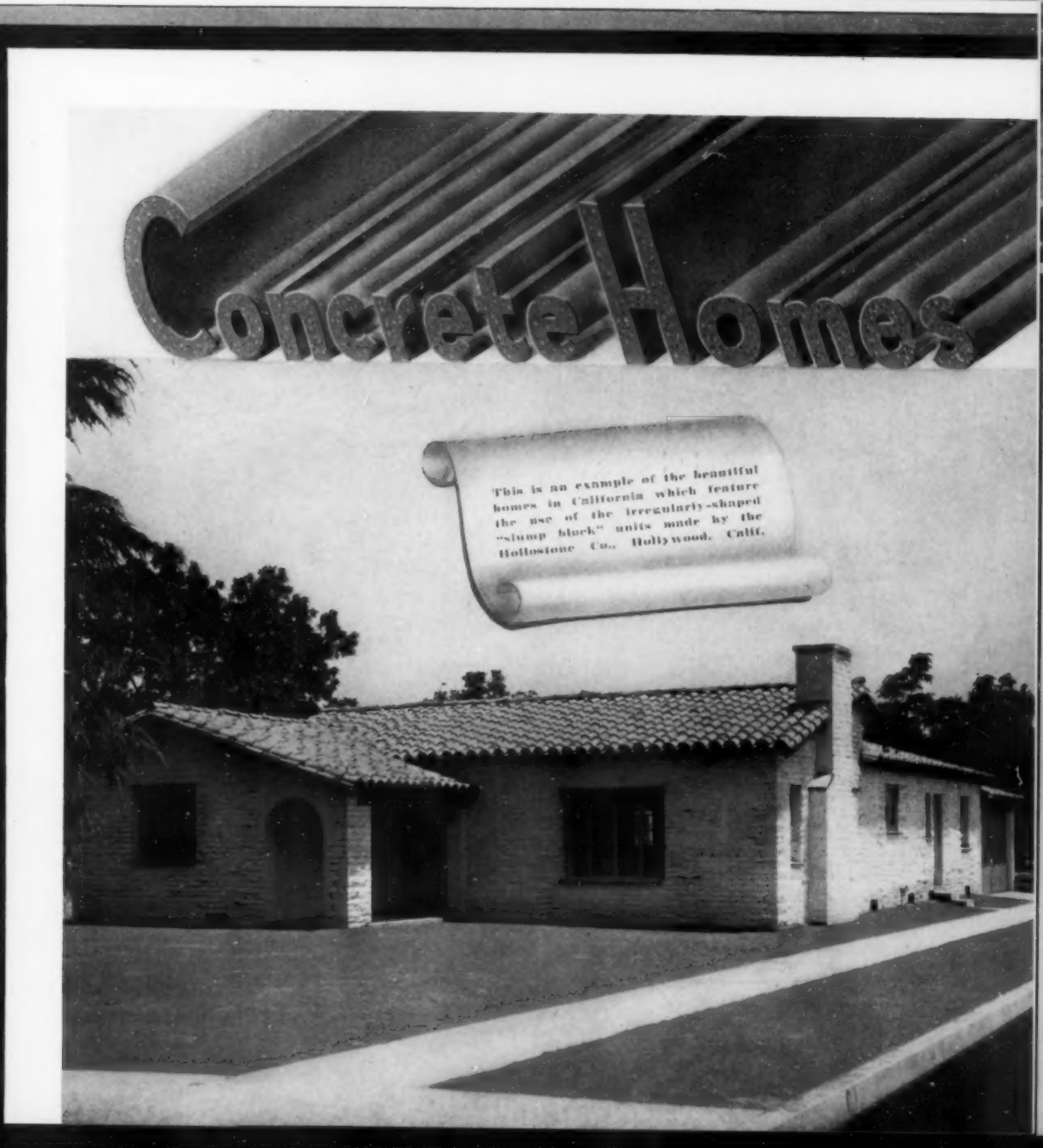
(Obituaries appear on page 87)

CONCRETE PRODUCTS AND CEMENT PRODUCTS



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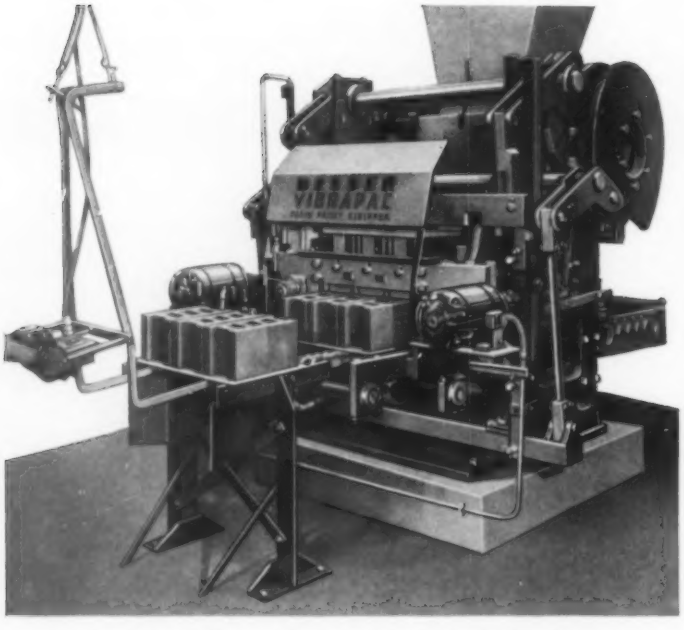
You cut original plant cost in half when you install a Besser Plain Pallet Stripper—either Vibrator or Tamper. The saving in pallet cost, in the average plant, is more than the cost of the machine.



Besser Super Vibrapac Plain Pallet Stripper capacity 600—8 x 8 x 16 blocks per hour. 8 x 8 x 16 blocks made 3 at a time on one Plain Pallet. Other sizes made in multiples on same set of pallets.

Besser Super Fully Automatic Plain Pallet Stripper operates at a speed of 6½ molds per minute. Block machine including Automatic Pallet Feeder and Automatic Front Conveyor, with 50 cu. ft. Batch Mixer and Skip Loader, assembled as a unit.

BESSER VIBRAPAC VIBRATION

The **Vibrapac vibration** principle is entirely different from that secured by any other vibration method.

Vibrapac vibration provides for the first time in any machine a satisfactory means of filling the mold by vibration and pressure without any auxiliary means. With Vibrapac vibration, units can be made from any standard materials and the degree of density easily controlled.

Ask for folder "21" Advantages of Plain Pallets. Write today for details and prices.
State daily production and sizes you want

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THE SAVING IN PALLET COST WILL PAY FOR A BESSER PLAIN PALLET STRIPPER

Concrete Products Set Production Records

Annual conventions of National Concrete Masonry Association and Cast Stone Institute draw record attendance

By BROR NORDBERG

CONCRETE MASONRY had a fine year in 1939, with a business volume better than any year since pre-depression days, and the industry is looking forward to a still better year in 1940. This optimism was very evident at the twentieth annual convention of the National Concrete Masonry Association which was held at the Mayflower hotel, Washington, D. C., February 12-14.

Attendance was between 450 and 500, comprising delegates from coast to coast and from Canada. The attendance figures were very impressive when it is considered that the exposition of machinery, which was the magnet that attracted record attendances at the last three conventions in Chicago, was discontinued this year. Moving the convention east successfully fulfilled its purpose in attracting more of the Eastern manufacturers of concrete products.

New Officers

ROY N. MCCANDLESS, Cinder Block, Inc., Detroit, Mich., was elected president of N. C. M. A. to succeed Harve E. Kilmer, Des Moines, Iowa, who will serve as chairman of the board of directors in 1940. Mr. McCandless has long been active in the affairs of the Association and is also president of the National Cinder Concrete Products Association.

Other officers were re-elected and one new member, Ray Berger, Martin Berger Cement Block Co., Detroit, Mich., was elected to the board of directors. Vice-presidents re-elected were John L. Strandberg, Concrete Building Units Co., Kansas City, Mo.; Walter Mannhardt, Best Block Co., Milwaukee, Wis. Roy L. Peck, Western Brick Co., Chicago, Ill., was re-elected secretary-treasurer, and E. W. Dienhart, Jr., was re-elected assistant secretary. The complete board of directors includes Roy N. McCandless, Detroit, Mich.; W. J. Mannhardt, Milwaukee, Wis.; John L. Strandberg, Kansas City, Mo.; Roy L. Peck, Chicago, Ill.; M. W. Ferguson, Roanoke, Va.; John S. Chase, Fort Worth, Texas.; Horace W. Bush, East Orange, N. J.; H. H. Longenecker, Philadelphia, Penn.; and Fred W. Reinhold, Buffalo, N. Y.

COL. MCCOACH, engineer, District of Columbia, opened the formal convention sessions with a welcome address on behalf of the Washington Board of Commissioners. He said that the District of Columbia had issued $71,000,000 in building permits in 1939, and that the city of Washington had used more concrete masonry per capita than any other city. He emphasized how important meetings, such as the N. C. M. A. convention, were in improving the quality of products and that concrete masonry had made notable progress in that respect in the last few years.

Roy N. McCandless, Detroit, Mich., new president, N.C.M.A.

He concluded by stressing the important part which concrete masonry has in today's construction and extended an invitation to the convention to visit some of the structures in Washington built with concrete masonry.

Milwaukee puts in its plug for next N.C.M.A. convention in lecture room

The Cement Products Bureau

"The Work of the Cement Products Bureau of the Portland Cement Association—How You as a Concrete Masonry Unit Manufacturer Can Get the Most Benefit from it" was the subject of a paper by W. G. Kaiser, manager, Cement Products Bureau, Portland Cement Association.

Mr. Kaiser outlined the purpose of the Bureau which is to improve and extend the use of concrete masonry, and compared the status of the industry today with what it was prior to 1920 when the industry began its rise. In those days concrete masonry was confined to basement construc-

Fig. 1: Roy L. Peck, secretary-treasurer, N.C.M.A., Chicago, Ill. Fig. 2: Donald G. Wood, vice-president, the Paragon Plaster Co., Syracuse, N. Y. Fig. 3: K. Van Dyk, Dordrecht Firma, Van Dyk & Co., Kalkfabrick, Netherlands, foreign visitor to convention. Fig. 4: Herb. Daunheimer, Springfield Sand & Tile Co., Springfield, Mass. Fig. 5: W. F. Douglass, Nashville Builders Supply Co., Nashville, Tenn.

tion and since has enjoyed a greater development and increase in usage than any other material now being used in all classes of building construction, said Mr. Kaiser. In those days quality was variable, and one of the jobs undertaken by the Bureau was to standardize quality.

Twenty years ago, concrete masonry was not written into any building codes, and was an unknown quantity and therefore there was little room for expansion. The Portland Cement Association started an educational program years ago, said Mr. Kaiser, that has placed concrete masonry in all the leading building codes.

He mentioned briefly the work yet needed in establishing concrete masonry walls as a fire resistant material, and referred to the fire tests completed in 1938 to give 8-in. solid walls a 4-hour fire retardent rating.

Fire insurance rates for concrete masonry construction were the same as for frame at one time said Mr. Kaiser, mainly because the fire insurance companies had no test data on which to base rates. Back in 1923 a start was made on developing such needed data and by 1927 rates the same as for brick construction had been adopted by 35 states.

Other efforts have been directed by the PCA toward financial organizations, such as building loan associations that want security assured when loaning money. As a result of the promotion, many of these organizations look favorably upon concrete masonry construction and are inviting loans.

In 1939, the Bureau had published a construction manual detailing the steps in construction with concrete masonry, complete with drawings and other details, which Mr. Kaiser said had met with the favor of architects.

Four years of effort in promoting concrete home construction has brought remarkable results. Concrete masonry was used above grade in 45,000 one- and two-family dwellings in 1939, and in one of every six homes built. This represents, on the estimate of 2000 8- x 8- x 16-in. or equivalent units per home, 90,000,000 units, or almost one-third of all the masonry units sold in 1939.

Mr. Kaiser called attention to the importance of the Federal Housing Administration and U. S. Housing Authority in the building of small homes. The latter organization alone was responsible for the construction of 57,000 dwelling units in 1939. In 1940, considerably more projects are to be undertaken by this organization.

Mr. Kaiser recommended a five point program for the manufacturer of concrete masonry to follow. First of all he emphasized that every job be followed intensively until the order is let to someone. Secondly, he suggested the cultivation of every representative connected with the local housing authority in every community. Third, he recommended the intensive cultivation of architects. His fourth and fifth points were to give quality, including dry units at the time they are placed into a wall, and to properly service every job, which means working with the contractor and includes seeing that the units are used properly.

He suggested that the concrete masonry manufacturer advertise locally and religiously follow up leads, get photographs of attractive houses published in the local newspapers, coöperate with builders in the construction of demonstration homes and plan coöperative programs with builders in order to actively get their share of the small home building and backup units, etc., in the larger buildings. Mr. Kaiser concluded by saying that 234,000,000 8- x 8- x 16-in., or equivalent, units were sold in 1939. This represented an increase of over 33⅓ percent over 1938, and the best year for the industry since 1927. A further increase is anticipated in 1940.

The Association's Field of Usefulness

HARVE E. KILMER out-going president of N. C. M. A. spoke on the subject "The National Concrete Masonry Association—Its Field of Usefulness to the Industry." Mr. Kilmer first expressed his gratitude on the attendance, and the need for all manufacturers to work together in an exchange of ideas freely, then outlined his ideas of what the national association should do for its members.

One point was to encourage the manufacture of better quality and better appearing units. This, of course, means care in the selection of aggregates and proper methods of manufacture. Secondly, he pointed

Board of Directors, N. C. M. A., convene for meeting. Left to right: Ray Berger, Detroit, Mich.; John Strandberg, Kansas City, Mo.; Harry Longenecker, Philadelphia, Penn.; George Krier, Brooklyn, N. Y.; Harve Kilmer, Des Moines, Ia.; E. W. Dienhart, Chicago, Ill.; right panel: Ben Wilk, Detroit, Mich.; Roy McCandless, Detroit, Mich.; Horace W. Bush, East Orange, N. J.; M. W. Ferguson, Roanoke, Va.; and W. J. Mannhardt, Milwaukee, Wis.

out the need for units that will continue to look attractive, which involves the use of proper impervious coatings, etc.

Other functions of the Association mentioned were the insistence on shipping thoroughly dried units, which have been stored under cover, and the exchange of new ideas in merchandising at the annual conventions.

The Association, in his opinion should develop test data and sponsor literature that will be helpful in promotion, such as the Underwriters' fire tests of 1938, which can be done at small cost to each member when done coöperatively, and should be a clearing house for information and an organization to develop enthusiasm in its members.

While in Washington, delegates to the convention took advantage of field trips to see concrete masonry jobs in the area, sightseeing trips to Mount Vernon and the White House and public buildings. At the conclusion of the convention, some 25 members took the Florida post convention steamship trip to observe how concrete masonry is utilized in Florida.

Important Resolutions

Several resolutions of importance were adopted at the close of the convention. One of the resolutions was that the N. C. M. A. prepare and distribute data on floor systems as an aid in further developing these markets in competition with clay tile. A second resolution adopted suggested that members in Congress be urged to pass the 1939 amendment to the U. S. Housing Authority which would expand the activities of that program.

It was further resolved that the Association express its sincere sympathy in the recent death of Lord Tweedsmuir, Governor General of Canada, through W. C. Smith, delegate to the convention from Toronto, Canada.

Other resolutions adopted were an expression of thanks to Dr. Lyman J. Briggs, director, National Bureau of Standards, for the coöperation and support of his organization and to the Portland Cement Association, Frank Sheets, its president, W. G. Kaiser, Paul M. Woodworth, E. W. Dienhart and Harve Kilmer for their valued coöperation in the work of the Association.

Bureau of Standards Research

AN ENTIRE SESSION on research was held in the lecture hall of the Bureau of Standards, with specialists from the Bureau discussing subjects of vital interest to the industry.

DR. A. H. STANG, senior engineer, National Bureau of Standards, spoke on loads on building walls and the strength of concrete masonry walls.

D. E. PARSONS, chief, masonry construction section, National Bureau of Standards, in discussing the water permeability of concrete masonry walls, described tests made using various types of mortar joints. The type of joint is of utmost importance in the wall's ability to resist the passage of water, he said.

When walls were subjected to water at 50 p.s.i., leakage occurred in two or three minutes with one type of joint, for example, while in other cases over five days were required to detect leakage. The workability of the mortar, rather than its chemical composition, was found to be of most importance. Ordinary exposed walls, regardless of the quality of the units, leaked under test through the joints. Portland cement stucco and brush coatings of cement-water paint were found effective in preventing leakage.

MRS. CLARA SENTEL, assistant chemist, Paint Section, spoke on the qualities of various paints for the exterior finishing of concrete masonry walls. Desirable qualifications for any waterproof paint should be toughness, flexibility and adherence, said Mrs. Sentel.

Paints were classified as cement-water paints, oil base paints, emulsified and rubber-base types. The proper amount of water is essential in the use of cement paints. Too much water lowers the bond and causes blistering, while too brittle a mix will result in flaking, she said. A coat of cement paint should be sprayed with water when it starts to dry and before application of a second coat.

Oil base paints were described as tough, impervious and durable with desirable spreading qualities. A dry wall is needed before application. Emulsified paints have been found to be a good paint, for application on either dry or wet walls, but these paints are subject to mildew. Rubber base paints have all the desirable qualities except for a tendency to disintegrate upon exposure to sunlight.

The research session concluded with a talk on fire-resistive dwelling construction of masonry by S. H. Ingberg, chief, Fire-Resistance Section, and the witnessing of a fire test of a concrete masonry wall in the laboratory.

Promotion

A SESSION on promotion featured talks by leaders in the housing movement and heads of important government departments in Washington. It started off with a motion picture prepared by the United States Housing Authority entitled "Housing in Our Time." The film was a portrayal of living conditions in the slums as contrasted to living in the modern low cost house as built today to replace slums. This was followed by a film produced by the Federal Housing Administration which is available for presentation in local communities.

An Attractive Package

"Concrete Houses Must Be Made an Attractive Package to Command Public Acceptance — Outline of Activities in Pennsylvania Which Have Been Successful in Popularizing Concrete Houses" was the title of a slide-illustrated paper by A. H. Wagner, housing and structural engineer, Portland Cement Association, Philadelphia, Penn.

Mr. Wagner said that the buyer of homes has become discriminating and always wants in a house what is beyond his means so it is a necessity to give him all possible for his dollar. The trend is toward the rural community and therefore more toward small homes. Mr. Wagner discussed the significance of the Portland Cement Association national advertising in developing pub-

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Fig. 1: W. G. Lush, left, and Ansel T. Rogers, right, both of the North American Cement Corp., New York City. Fig. 2: Left to right, John S. Bailey, Concrete Manufacturing Co., Atlanta, Ga.; Roy Marshall, Detroit, Mich.; and Gene Olson, Stearns Mfg. Co., Adrian, Mich. Fig. 3: C. Grady Cates, Cinder Block, Inc., Roanoke, Va. Fig. 4: John T. Turner, Chief, Cement Section, U. S. Bureau of Standards, Washington, D. C. Fig. 5: Mrs. and Mr. I. J. Westerveld, Wausau Concrete Co., Wausaw, Wis. Fig. 6: W. Chester Smith, Cooksville Co., Toronto, Canada. Fig. 7: Homer L. Rogers, Price Brothers, Inc., Dayton, Ohio, on the left; and L. G. Randolph, L. G. Randolph Concrete Products Co., Ann Arbor, Mich., on right. Fig. 8: J. W. Warren, Southern Cast Stone Co., Knoxville, Tenn. Fig. 9: W. Chester Smith. Fig. 10: George H. Krier, Nailable Cinder Block Corp., Brooklyn, N. Y. Fig. 11: On left is Louis Brookman of Concrete and on right is H. B. Emerson, Lehigh Portland Cement Co., Chicago, Ill. Fig. 12: Left to right, R. C. Yant, Yant Construction Co.; J. L. Bergman, Omaha Concrete Stone Co.; and E. W. Peterson, Ideal Cement Stone Co. All are of Omaha, Neb. Fig. 13: On the right is G. A. Hummel, Lone Star Cement Corp., New York City. Fig. 14: S. A. Elkan, Elkan's Stone Tile Mfg. Co., Macon, Ga. Fig. 15: Harold L. Spaight, Cedar Rapids Block Co., Cedar Rapids, Ia. Fig. 16: Albert G. Streblow, Basalt Rock Co., Napa, Calif., second from left and Homer L. Rogers, Price Brothers Co., Dayton, Ohio, second from right, discuss flexicore system

lic acceptance in Pennsylvania and the close coöperation between the concrete products manufacturer, realtor, loan organizations and mortgage institutions that is putting the concrete house across in Philadelphia.

The Orland development was given as an example of the application of mass production methods to the building of low cost homes. A demonstration house was built in May, 1938, and publicized to the extent that 3000 people visited it on the opening date and eight similar homes were sold. In this community there are now 175 concrete houses, having six rooms and garage, some having basements, and selling for $3490 including the lot.

This was followed by a description of the Fox Chase Manor development which now has 110 concrete houses resulting from the efforts of the same concrete products manufacturer in coöperation with other building organizations. Fifteen such coöperative groups are now working in Pennsylvania.

U.S.H.A. Housing Program

NATHAN STRAUS, administrator, U. S. Housing Authority, Washington, gave an inspirational talk on "What the U. S. H. A. Housing Program Means to the Building Industry—The Task Accomplished and the Job Ahead," in which he gave some figures highly encouraging to the building industry. The net construction cost for homes built under the Authority in replac-

1: L. E. Schwalbe, Economy Block Co., Milwaukee, Wis., at right. Fig. 2: C. P. Lower, Bethayres Concrete Products Co., Bethayres, Penn., at left, and Sam Edmonds, Edmonds Art Stone Co., Washington, D. C., at right. Fig. 3: Left, A. H. Patterson, Cinder Block Corp., Baltimore, Md.; center, Herbert A. Davis, Washington Concrete Products Corp.; and right, Sam W. Williamson, Media Concrete Products Co., Media, Penn. Fig. 4: O. L. Formigli, Formigli Arch Stone Co., Berlin, N. J., secretary-treasurer of the Cast Stone Institute. Fig. 5: Harry B. Emerson, Lehigh Portland Cement Co., Chicago, Ill., registering. Fig. 6: Monroe A. Evans, Ellis Concrete Products Co., Bridgeport, Penn. Fig. 7: Another view of Herbert A. Davis, Sam W. Williamson and A. H. Patterson. Fig. 8: Walter A. Sherman, consulting engineer and marketing counsellor, Milwaukee Concrete Products Association, Milwaukee, Wis. Fig. 9: W. J. Phelan, Cedar Rapids Block Co., Cedar Rapids, Ia., on left. Fig. 10: Alfred Padiella, Hamden Building Tile Co., Hamden, Conn. Fig. 11: Ralph C. Condo, left, James Condo & Son, Sommerville, N. J., demonstrates model of his floor system to W. F. Douglass, Nashville Building Supply Co., Nashville, Tenn. Fig. 12: Otto Buchner, Otto Buchner & Co., Salt Lake City, Utah, and a Director of the Cast Stone Institute, on the right. Fig. 13: R. S. Phillips, Chicago, Ill., on the left; and W. H. Bartlett, Atlanta, Ga., on right. Both are Portland Cement Association men. Fig. 15: M. W. Ferguson, American Block, Inc., of Roanoke, Va.,

ing slums has been $2820. Mr. Straus discussed the social and economic benefits to be derived under the program and the economic benefits which will help return prosperity to the building industries. Every dollar spent goes into private business, he said. Thus far the Authority has spent $26,000,000 for cement and cement products, $6,000,000 in pay envelopes and 4,800,000 man hours of labor.

Another interesting fact brought out was that four out of five public housing projects have specified fire-safe concrete floors and masonry walls. Mr. Straus mentioned an intangible but real benefit to be derived from these projects, which is the opportunity to test concrete masonry and the chance to learn to build these homes, which will be a valuable experience in future private building. Housing, in his opinion, is the nation's most urgent problem next to re-employment and the building of homes is important in solving the major problem.

Mr. Straus said that it was important to recognize the market and serve it, alluding to the fact that thus far the upper third income group is the only one that has been recognized. In his opinion, the middle and lower income groups, or two-thirds of the potential market for houses has been overlooked. U. S. H. A. has started on the lower income levels and the upper third income group has reached a saturation point, said Mr. Straus. Each of the lower thirds comprises 11,000,000 families and a market for 300,000 new homes annually. In 1939, only 58,000 homes were built in the middle bracket and 55,000 in the lower groups (below $1000 annually). In conclusion, he said that there is a beautiful opportunity for the building industry, if it will recognize the wage groups which are most in need of new homes.

JOHN L. FAHEY, chairman, Federal Home Loan Bank Board, Washington, went into considerable detail on financing facilities and construction requirements of houses needed to warrant loans, in a talk, "The Federal Home Loan Bank Plan for Insuring Quality Construction for Residences." Sound construction is of vital importance, he said, in order to justify loans. In the past it was surprising in what poor shape foreclosed homes were found to be in, which resulted from the jerry building of the 1922-1930 period The real need,, in his opinion, is for a house of sound construction not to exceed $4000 in cost. Another urgent need is the improvement of old houses, which are in bad shape because of the faulty character of the construction when they were built.

RICHARD R. QUAY, speaking for Stewart McDonald, administrator, Federal Housing Administration, Washington, on the subject "Adjusting Housing to its Market—The F. H. A. Program in Both Large-Scale and Single-Family Housing," said that the surface had barely been scratched in the field of low cost house construction. He said there was a need for 10,000,000 new dwelling units to be built in the next ten years and that progress in building low cost homes depends on how rapidly the construction industry adjusts itself to the demand. As far as cost is concerned, he said that a reduction of as little as two dollars monthly is often vital, but that progress was being made in reducing costs so that monthly payments are more favorable. The F. H. A. organized 2000 subdivisions in 1939 and has lowered the interest rate to 4½ percent to encourage more building.

Precast Concrete Floors

ONE OF THE LIVELIEST SESSIONS of the convention was that set aside for the discussion of new developments and adaptations of precast units for floor construction. Manufacturing methods used by producers of concrete masonry in making the more standard floor units also were discussed.

One of the new floor systems was described by Ralph Condo, James Condo and Son, Somerville, N. J. The system consists of T sections whereby the slab and flange are cast in one piece to the desired length and used for joist and floor slab or joist and ceiling slab.

Units are ready to carry the superimposed live load, according to specification, as soon as placed in this system; which has a dead air space provided wherein conduits and piping are easily put through. The same dead air space provides the acoustical properties desired. According to Mr. Condo, the units are competitive in price with any other type of floor or ceiling.

The ordinary unit is 16¾-in. wide by 1¼-in. thick, (slab section) has a 3-in. web thickness and is 7¼-in. overall in depth, and is manufactured to the desired span length. Its design is such that the T sections are adaptable for the construction of floors, ceilings, roofs and small bridges and culverts, said Mr. Condo.

It may be installed with the slab piece down or up, depending upon the use. With the slab side down, the ceiling is ready for the application of covering, if desired, wood for example being applied to nailing strips. In the reverse position, the floor is ready for the application of linoleum or other flooring direct to nailing strips.

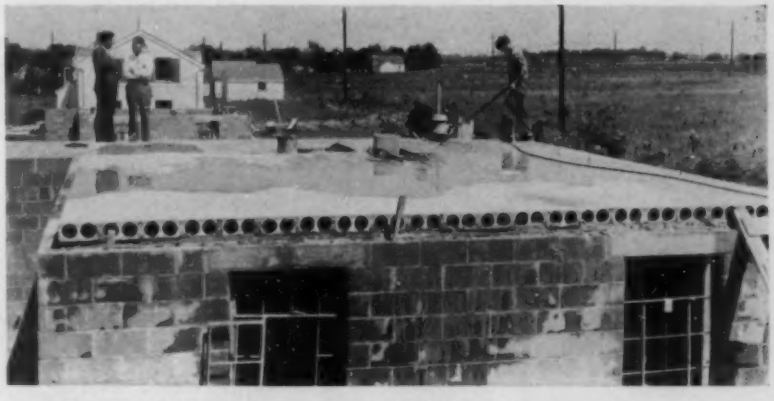
When used for construction of a roof, lengths up to 20 ft. have been used with the T in the normal position ready for the addition of hot asphalt and felt. According to Mr. Condo, when used in small bridges or culverts there is a saving in form work on the job. In these applications, the T is inverted and the hollow space formed is filled with concrete for load-bearing purposes.

On a test run, 761 sq. ft. of slab have been laid in 5½ hr. by four unskilled laborers. Reinforcing steel is designated according to the load to be carried. On a laboratory test, using an 81-in. span (8-ft. specimen) and loading the center of the span to its full width, the unit withstood a loading of 2480 lb. with a deflection 0.32 in. with the slab side up. In the inverted position, the figure was 2580 lb. with a deflection of 0.30 in. The mix was a 1:2:3 with a water-cement ratio of 4.66.

Weight of the unit is 31 lb. to the lineal foot, using pea gravel as aggregate, which Mr. Condo said will be reduced to about 20 lb. with lightweight aggregate. Cost of placing is 1½c per square foot and the cost to the job is about 45c per square foot. The units are molded by vibration and stripped in 2 hours after casting.

Flexicore Method

"The Flexicore Method of Precast Concrete Floor Construction" was described by H. L. Rogers, manager, Flexicore Division, Price Brothers Co., Dayton, Ohio. The Flexicore unit is a floor slab rectangular in section, ordinarily 6- x 12-in., having two 4- and 5-in. circular cores extending the length of the slab. Core area is 50 percent.



Finishing the roof of a new home having Flexicore roof slabs made by Price Bros. Co., Dayton, Ohio

These slabs are molded by vibration, using flexible rubber hose to form the cores. The hose is inflated by air under pressure to the desired diameter in the molds, the units are cast, and after the initial set takes place the rubber tubing is deflated and withdrawn.

Weight of the units is 38 lb. and 25 lb. for heavy and lightweight aggregates, respectively. Normal reinforcing is three tension bars and two on the compression side. The reinforcing can, of course, be varied and the diameter of the core areas and depth of the slab changed to meet special conditions. Maximum length thus far used is 22 ft. 6 in., and the normal bearing allowance at each end is 3 in. In most jobs so far Mr. Price said that no plastering was used on the slabs.

Showing new floor system developed by Ralph C. Condo, Somerville, N. J.

An interesting feature of the construction is that the tension bars are pre-stressed. The steel is stretched in the molds enough to compensate for the load to be applied, forming a slight crown upwards in the middle of the span. When the load is applied, the normal deflection just balances the artificially made crown and the unit straightens out. This, said Mr. Rogers, is instrumental in preventing shrinkage cracks in the floor slab.

Placing has been done at the rate of 400 sq. ft. per hour on the job. Clamps and a removable set in grout grooves are used in placing to get a tight fit. A net price of about 30c per sq. foot is realized at the plant.

Stocking Joists and Cutting to Length Desired

The problem of being able to furnish precast concrete joists to the job in reasonable time was discussed by Dave Warsaw, Hay-Con Tile Co., Detroit, Mich., in a talk, "Stocking Precast Concrete Joists and Cutting to Required Length is Now Practical."

Representation of Cinder Block, Inc., Roanoke, Va. Left to right: V. G. Gearing, C. Grady Cates, R. V. Nash in front, J. W. Cates in rear, W. A. Clark, Jr., A. Lee Bowling, and Al Bernard, Jr.

His practice is to stock joists ranging in length from 8 ft. 8 in. to 16 ft. 8 in. with a number of intermediate lengths and to cut them to exact requirements of a job. The difficulty was in getting a saw which would cut through a combination of steel and concrete and stand up under that kind of service.

A number of carborundum-type saws, some commercial and some specially built, were tried with indifferent success. Some had steel centers, some had rubber centers, and various diameters and revolving speeds were tried. Some of the wheels lasted only for five cuttings and others broke prematurely.

Recently, Mr. Warsaw has gotten 41 cuttings of 8-in. joists from a carborundum wheel, using 3300 r. p. m. at the arbor and requiring 30 to 35 seconds to cut through the joist without application of water. Mr. Warsaw's paper was followed by considerable discussion as to cutting speeds and whether dry or wet cutting should be used but no definite conclusions were reached.

Curing Electrically

Joseph Nagy, Columbia Block and Supply Co., Toledo, Ohio, described a system of curing developed by his company in coöperation with the Toledo Edison Co. for "Increasing the Speed of Curing Precast Concrete Joists Through the Use of Electricity."

In this system heating coils are used to develop temperatures of about 160 deg. using hollow metal cores and distribution cables. The power requirement is 800 watts for an 8-in. by 20-ft. joist or 40 watts per foot of joist. The connected power supply is 7.2 kilowatts at 220 volts. Total cost including G. E. soil cable and other accessories was $65 excluding, of course, the power requirement.

By the use of electricity, the joists are stripped 5 hr. after operations started with an electricity cost of 3.2c per 20 ft. of joist. Joists so cured develop strengths of 4200 to 4800 p. s. i. at 28 days using high early strength cement.

In center of group: D. J. Warsaw, Hay-Con Tile Co., Detroit, Mich., exchanges notes with a group of concrete masonry men

Ralph C. Condo, James Condo & Son, Sommerville, N. J., demonstrates floor system to interested group

Manufacturing Problems

PAUL M. WOODWORTH, Portland Cement Association, Chicago, Ill., led off an interesting session on manufacturing with a paper, "The Concrete Masonry Industry Tests its Products for Strength and Durability. Tests Made at the University of Wisconsin—How to Interpret the Results and Apply Them to Plant Practice."

Mr. Woodworth, who was active in the test procedure, described briefly the character and purpose of the tests and the results, and summarized with some valued suggestions as to how to use the conclusions to advantage. The tests were conducted to determine performance of units made of various aggregates and to compare those made by vibration with tamped units.

Seven different aggregates—cinders, Haydite, limestone, Pottsco, sand and gravel, Superock and Waylite, were used to show the effect of vibration versus tamping on compressive strength, absorption, capillarity, specific weight, durability, volume change and thermal expansion coefficient for each aggregate. Similar data were developed for variations in cement-content for each aggregate.

To develop the comparison of the effects of vibration and tamping on the various properties of units so made, the tests were limited to one grading of one aggregate for each type and to limit molding practice to one method of procedure on one make of tamping and one make of vibration equipment.

Physical tests included determinations of weight per cubic foot and sieve analyses on fine, coarse and combined aggregates; compressive strength at 7 and 28 days, absorption at 28 days, weight per cubic foot of concrete, capillarity and yield on 8- x 8- x 16-in. 3-cell, 45 percent core area units; compressive strength at 170 days, volume change through two cycles of wetting and drying, temperature coefficient of expansion and resistance to 100 cycles of freezing and thawing on 8- x 8- x 8-in. halves of full-sized units.

Batches were designed to produce 45 block (1¼-in. face shell, 45 percent core area) with each type of molding equipment. A Stearns Jolt-crete machine in the plant of the Midwest Concrete Pipe Co., Forest Park, Ill., and Besser heavy duty power strippers in the plant of Best Block Co., Milwaukee, Wis., were used to manufacture the units. Units were cured in regular moist curing rooms for 24 hr. and stored under cover and tests conducted according to accepted procedure. Yields in all cases approached the desired 17, 25 and 33 units per sack of cement for which the mixes were designed, but mix proportions and water content were varied for different classes of materials.

Durability ratings were based on three factors: weight loss and the ratios of strength after 100 cycles of freezing and thawing to the strengths determined at 28 and 170 days. Units were required to show no loss of weight and to show a minimum strength ratio of either 0.95 at 28 days or 0.90 at 170 days to merit a rating of excellent. A loss of 2 percent and ratios of 0.90 or 0.85 re-

Removing a full rack of units at the plant of Concrete Units, Inc., New York, N. Y., using a Clark Tructractor

spectfully was allowed for a rating of good.

Conclusions of Tests Tamped Vs. Vibrated Units

Conclusions for equivalent yields with the same aggregate held that vibration-produced units had higher early strengths and slightly lower absorption than those made by tamping. Vibrated units were lighter except for the sand and gravel mixes. Compressive strength and specific weight decreased and absorption increased as yield in terms of units per sack of cement increased in about linear relationship for each aggregate used.

Thermal expansion coefficient varied per degree Fahrenheit from a low of .0000021 for cinders to a high of .0000055 for sand and gravel. Volume changes followed changes in moisture, and were proportioned to the cement content. In most instances, tamped units exhibited slightly greater volume changes than vibrated units.

On the other hand, a larger proportion of the tamped units than those vibrated proved durable under 100 cycles of freezing and thawing. This was true with yields of 17, 25 and 33 blocks per sack. The average strength after 100 cycles for the 26 mixes which rated above failure was 18 percent higher than the 28-day strength and 14 percent higher than the strength of control specimens tested at a comparable age.

On the basis of these tests, it was concluded that good or excellent resistance to 100 cycles is assured if the units show no weight loss at the end of 50 cycles. It was further concluded that present specifications of 700 p. s. i. compressive strength at 28 days, and a maximum absorption of 15 or 16 lb. per cubic foot of concrete are inadequate to insure masonry units which will be sound and durable under severe exposure conditions.

No apparent correlation between absorption and durability was observed although there is a possibility that the rate of absorption may be indicative of durability. A satisfactory specification based on the tests which insures excellent resistance to freezing and thawing for lightweight aggregates is a compressive strength at 28 days of 900 p. s. i. gross area and a rate of absorption not over 0.87. It was further concluded that a minimum compressive strength of 1000 p. s. i. gross area be recommended for load bearing units.

Further studies should include the effect of differences in the proportion of aggregate passing the 50-mesh sieve on the rate of absorption, strength and durability and, in the case of expanded slag aggregates, the effect of variations in the methods of vibration molding and the influence of variations in grading on durability, in Mr. Woodward's opinion.

In interpretation of the results, it was definite that sound, durable units can be made with any of the principal types of aggregates now in use. Secondly, there are definite yield limits varying with a particular type of aggregate which cannot be exceeded with safety. The percentage of extreme fines, especially with lightweight aggregates, apparently is important as regards resistance to frost action.

Specification limitations on moisture content of the unit when delivered on the job, 40 percent of the total absorption, will reduce the volume change 50 percent or more than that obtained with units in a saturated condition, depending upon the aggregate type. Vibrated units have the advantage of higher early strength and also are lighter in weight for lightweight aggregate, but tamped units are more resistant to frost action, according to Mr. Woodward's interpretation of the tests. Differences in amount of volume change either from moisture or temperature, total absorption and strength at 28 days are not enough to warrant a preference toward either type of molding.

New Type of Curing

"A New Type of Curing to Reduce Moisture Content of Concrete Masonry Units," a paper prepared by W. E. BARNEY, Hydraulic Press Brick Co., Cleveland, Ohio, was read by E. W. Dienhart in the absence of Mr. Barney. The paper dealt with the use of forced air to overcome the problem of volume change.

A portable apparatus was developed at this plant in order to give assurance that concrete units when delivered to the job would contain less than 40 percent of their total absorption as required to meet A. S. T. M. specifications.

The process consists of applying forced draft circulation of air to the concrete units while they are in stockpile in order to shorten the

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period of stockpiling and to expedite delivery.

The apparatus, which was illustrated in action by slides, consists of a 25-in. diameter, 6-blade fan driven by a 7½-hp. motor—the unit being mounted on a cart for mobility around the stockpiling area. The actual power input is 6¼ hp. when driving the fan at 1600 r. p. m. and

Crowd viewing fire test of masonry wall at Bureau of Standards

delivering 2500 c. f. m. of air. The requirement is for one cubic foot of air per block per minute to show a loss of 0.4 lb. of moisture in 6 hr. under a condition of 60 percent humidity at 76 deg. F.

The units are arranged in a staggered fashion with cores vertical in covered stockpiles, and the forced air is driven beneath the pile through horizontal pipes, and rises between the units as it escapes, thus coming into contact with all the units. The first course of units is below the ground level. The principle is one of accelerated air drying and appears to have some merit, particularly in plants where storage area is limited and where specials might ordinarily delay delivery. The process has been in operation two months, using a 12 hr. cycle.

Handling and Stockpiling

The paper, "Study of the Handling and Stockpiling of Concrete Masonry Units in the Plant and the Yard," by EZRA W. CLARK, president, Clark Tructractor Co., Battle Creek, Mich., was read by Roy Marshall, Adrian, Mich.

The paper was illustrated by colored slides and was concerned principally with the adaptation of power lift equipment in a number of plants under varying conditions. Part of the preliminary discussion dealt with early methods of handling, going back to the days when the machine was moved in preference to the block.

One of these pioneer companies, the Pottsville Building Block Co., Inc., Pottsville, Penn., has gone through the various stages in the development of handling methods. This concern, according to Mr. Clark, objected to the inflexibility of a system of permanent tracks, and is now using a gas-driven platform lift truck to remove blocks from the kiln and to take them to the exact desired location in the yard for piling. By saving unnecessary handling, this concern was said to have reduced labor costs on these operations 50 percent. The lift truck is said to have cost half as much to operate as the old gas tractor it displaced, and has now been in operation over 12 years.

Another slide illustrated the use of power lift trucks in the plant of the Paragon Plaster Co., Syracuse, N. Y. Two machines handle the plant output of 5000 units daily, and do a variety of other jobs around the premises. Each of the trucks operates on five gallons of gas for eight hours. The trucks are equipped with special spring mounted platforms to prevent undue vibration and shock in handling green units.

Another illustration was in the Martin Berger Cement Block Co., Detroit, Mich., which has displaced hand lift trucks by powered trucks.

At the plant of Ramloc Stone Co., Albany, N. Y., a total load of 2½ tons of units are handled on a steel rack of five shelves by a power lift truck. Only one man is needed in place of several and the company has experienced a reduction in accidents, such as crushed feet.

In another illustration, Media Concrete Products Co., Inc., Media, Penn., 30 tarpaulins 20- x 20-ft. in size are used to cover part of the cinder blocks. At this plant, tarpaulin's have been advantageous in protecting units from rain, snow and ice and allow flexibility of height, up to 24 units high.

At Bethayres, Penn., the illustrations showed the handling methods by power lift trucks at Bethayres Concrete Products Co. According to the plant operator, the truck would be capable of handling 12,000 solid 8- x 8- x 16-in. units daily with an average distance of 300 ft. from kiln to stock pile. Labor costs were said to have been reduced from $1.55 for handling labor in getting 100 solid blocks from the cinder pile to the storage yard to 90c per 100.

In Mr. Clark's paper, it was emphasized that units be piled high to take full advantage of ground area and particularly so if stockpiles are covered. Mr. Clark followed his discussion of high stockpiling by a description of a new system for handling cured blocks that is being adopted simultaneously in the clay products and concrete products industries.

This power unit is a fork truck used to pick up a load, and carry it to storage. The units are stacked on a wood pallet or "flat." The forks are slid under the flat loaded with blocks to lift it up, and the machine elevates the load to 108 in. in 25 seconds for high piling. A slide showed one of these machines in operation at the plant of D. J. Kennedy Co., Pittsburgh, Penn., withdrawing blocks from storage for truck shipment.

Covered Storage

A. L. BOWLING, Cinder Block, Inc., Roanoke, Va., in a paper, "An Efficient and Inexpensive Covered Storage," discussed the value of covered storage in regard to contained moisture at the time of delivery. At Mr. Bowling's plant, cinder block normally contain 75 percent of possible absorbed water when placed in storage. After they have dried out to pass the 40 percent A. S. T. M. limitation, experience shows that covered storage maintains a constant degree of moisture in all the units.

According to Mr. Bowling, 90 percent of the total volume change takes place because of the moisture contained below 20 percent. It is his belief that when units are dried out below that figure, volume change becomes more serious than if they had not been dried out so much. It is his impression that the upper limit in specifications on contained moisture should be raised, and that a lower limit be set below which the moisture cannot be driven out.

The plant of Cinder Block, Inc., has a 30- x 200-ft. covered storage shed beneath which units are stacked up to 12 ft. The shed has a capacity of 130,000 units and has an A-type roof of metal construction, built at a cost of 25c per square foot of area covered.

In testing the effectiveness of covered storage in drying units, Mr. Bowling said that the contained moisture was 21.6 percent for units covered a period of 126 days. For the same period, units in open storage contained 39.2 percent moisture, during a period of moderate rainfall for that area.

At 68 days, the figures were 23.3 percent as compared to 43 percent for uncovered units, making it a necessity to have covered storage to meet present specifications at that age.

Cast Stone Industry To Guarantee Quality

QUALITY AND PROMOTION were given emphasis at the annual convention of the Cast Stone Institute held simultaneously with the annual convention of the National Concrete Masonry Association in Washington, D. C., February 12, 13 and 14.

President M. A. Arnold in his opening address, expressed gratitude that we live in a country that is free and wherein it was possible for an industry to get together as a trade association to work out mutual problems in a spirit of coöperation. Two past presidents, Ernest Wiedemann, and Herman Frauenfelder, were introduced following Mr. Arnold's talk.

C. G. WALKER, assistant secretary, in his annual report, admonished the members that they were devoted, as members of the association, to extend the use and uphold the quality of cast stone. He urged that certain products be standardized, that literature be studied, and that more use be made of the Institute's facilities. He emphasized that the industry will progress by producing concrete in its highest form and not merely by imitating natural stone.

In conclusion, he said that the industry must keep alert, and not let placed-in-the-field concrete do those things that the cast stone industry can do much better.

C. S. STEPHENS, secretary, National Terrazo and Mosaic Association, in a talk "Benefits and Responsibilities of Trade Association Membership," said that an association like the Cast Stone Institute must coöperate against group competition. He said that the industry cannot hope to succeed when members fight each other, and that working together for the success of each other is the way to help business.

Favor Bonded Guarantee

Considerable discussion developed over the proposal to introduce into the cast stone industry the bonded guarantee method of insuring quality and appearance of cast stone — a guarantee that cast stone supplied to the job has the quality and appearance specified by the architect. The proposal does not have a performance guarantee, only quality (strength per sq. in.) and appearance.

Practically all members were in favor of the plan which would cost ¾ of one percent, or $37.50 for a $5000 contract, for example. This price has been set by a bonding company.

Waterproofings

The report of the laboratory studies of integral and surface waterproofings indicated that the members of the Institute can obtain definite benefits by their use. These products will benefit a good, well-made cast stone but will not make a poorly-made cast stone perfect, it was agreed.

M. A. Arnold, right, Arnold Stone Co., Greensboro, N. Car., and president of Cast Stone Institute with W. W. Kutsche, Sun Building Material Co., Dearborn, Mich., at left

Regardless of the development of such products, opinion was that skill, patience and craftsmanship are still necessary in putting together the ingredients in cast stone.

A round table discussion on reinforcing in cast stone revealed that quite a number of cast stone manufacturers need more light on this important subject and it was the consensus of opinion that members give further study to the subject.

Quality Cast Stone Needed To Meet Competition

R. S. PHILLIPS, concrete technician, Portland Cement Association, Chicago, Ill., in a paper "Review of the Fundamentals of Cement and Concrete with Special Reference to Their Application Under Plant Conditions," stressed the fact that cast stone is concrete, and concrete in its highest form. He emphasized that to make good cast stone like good concrete requires a thorough knowledge of the principles of concrete making and the application of these principles.

A thorough understanding of aggregates and their grading, the action of portland cement, the function of mixing water and curing were some of the fundamentals mentioned as absolutely necessary to apply in making cast stone. He concluded by saying there is evidence that high class concrete is being made in the field and that this fact deserves the attention of all cast stone manufacturers because field-produced exposed aggregate concrete is making inroads on the cast stone industry.

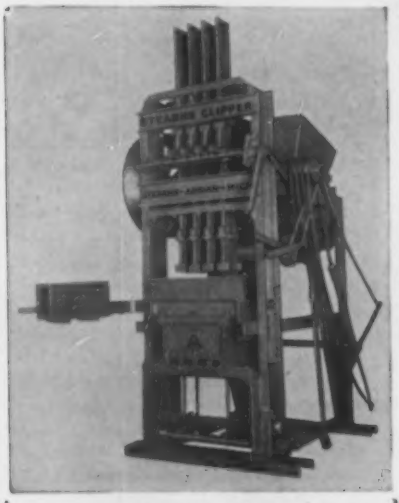
High Pressure Steam Curing

The paper on high pressure steam curing of the cast stone used on the School for Crippled Children, at Den-

At left, Henry E. Buchholz, Chicago Insulcrete Co., Franklin Park, Ill., and Mrs. Buchholz, enjoying themselves at the banquet

ver, Colo., by JOHN K. SELDEN, was pertinent because it was the first time the process had actually been applied to cast stone. The desired results of early cured, strong and hard cast stone were achieved after overcoming certain mechanical difficulties but the cost of equipment and operation is still too high for general consideration.

The round table discussion on elastic painting compounds revealed that a few manufacturers are making use of Institute data on the subject but not generally. Studies on this subject are to be continued.



George L. Rackle, Geo. Rackle & Sons Co., Cleveland, Ohio

HENRY MILLER, assistant director, Trade Practice Conferences, Federal Trade Commission, read a paper on how the cast stone manufacturers could organize into a trade association. He explained the advantages of so doing and said that the ills of the industry have a possibility of being corrected. He said that the Federal Trade Commission can help a trade association where and when it is difficult if not impossible to help an individual.

Several members participated in a discussion of systems of cost keeping methods used by their own companies.

Several subjects were referred to committees, as follows: The matter of giving a bonded guarantee on quality and appearance of cast stone; reinforcing in cast stone; to study a change in the method of paying dues; the annual award of a merit badge for the most outstanding cast stone job, and also for outstanding service to the industry; the placing of standard samples in the offices of the government procurement division.

Special Meeting for Cinder Products

NATIONAL Cinder Concrete Products Association held one separate meeting to discuss promotion methods and the report of the specification committee headed by A. G. Watt, Lehigh Portland Cement Co.

The specification drawn up and adopted agrees in most respects with federal specification 5S-C-621 and/or A. S. T. M. specification C90-36 with few differences. The new specification supplements the others by insertion of a weight requirement of 75 to 100 lb. per cu. ft. of concrete for the dry concrete in the units and states how the figure is to be determined. Another addition is that combustible content of a cinder unit be limited not to exceed 3.5 percent by weight.

It is further stated that no dimensions shall vary more than 3 percent over or under the specified dimension for any form or size of unit, but in no case shall any dimension vary more than ¼ in. from specified size. Both federal and A. S. T. M. standards have the 3 percent provision only, and the Underwriters Laboratory has the ¼-in. provision only.

In testing, the new specification stipulates that samples be representative of the whole lot of units as compared to 8 per 10,000 (federal) and 10 per 10,000 (A. S. T. M.). The only other change is the addition of specifications to govern combustion test samples, not provided for in the other specifications.

It is specified that one unit be broken into fragments and that three representative fragments be selected weighing over five pounds.

It was voted that a trademark for each manufacturer be registered with the Association effective February 1, 1941.

Will Make Cement In Hawaii

HAWAIIAN GAS PRODUCTS, LTD., Honolulu, Hawaii, has announced through Allan Renton, president and general manager, that his company has acquired the Waianae Lime Co., at one time the largest producer of lime in the territory. It is planned to shut down the lime plant at Waianae, which is about 30 miles from Honolulu, do the necessary quarrying there, and transport the rock to Honolulu, where lime will be manufactured at the main plant. The CO_2 is made into dry ice. This will give the Hawaiian Gas Products a volume of about 10,000 tons of hydrated lime per year. It is the intention of the company to convert the Waianae installation at the quarry site to a cement manufacturing unit. Tests of silica rock, situated about three miles from lime quarry, have proved satisfactory for the manufacture of portland cement.

Erie Stone Sold to France Stone

E. H. FRANCE has disposed of his interests in the Erie Stone Co. to the France Stone Co., Toledo, Ohio. It was announced that no change would be made in the personnel of the force operating the plants. The Erie Stone Co. operated six plants at Bluffton, Greencastle, Huntington, and Kokomo, Ind., and at Delphos and Whitehouse, Ohio.

Building All-Steel Sand and Gravel Structure

NORTHERN GRAVEL CO., West Bend, Wis., has dismantled its sand and gravel plant at Barton, Wis., and is building a new all-steel plant to be completed before the 1940 construction season.

To Develop Silica Lands

THOMPSON SILICA CO., Thompson, Ohio, recently organized, has been working on a deposit of silica sand on a small preliminary scale, south of Thompson in Geauga county. The company is considering construction of a sizeable, modern plant in the Spring.

Mica Production Going Up

NORTH CAROLINA mica mines are reported working night shifts as a result of increased demand for insulation purposes from the war industries. There are about 300 mica mines in the western part of the State, which produces about 60 percent of all the mica produced in this country. Many plants idle until recently are now in production. In 1938, North Carolina produced more than 24,450,000 lb. of mica.

Ohio S. & G. Association Re-elects Officers

THE OHIO SAND & GRAVEL ASSOCIATION held its annual meeting in Columbus on February 5 with President Wm. E. Hole, presiding. An interesting program included: a talk by Geo. Hammond on "Merit Rating;" a report by T. F. Kearns, and a review of federal legislation by President Hole. Luncheon speakers were Hal G. Sours, assistant highway director; H. D. Metcalf, chief of the Bureau of Maintenance of the Ohio Highway Department, and R. C. Caley, secretary of the Ohio Good Roads Federation. Discussions in the afternoon on operations and testing of materials was led by R. R. Litehiser and Geo. D. Scheuneman.

Officers elected were William E. Hole, president; J. H. Evans, vice-president; S. Stepanian, treasurer, and Claude L. Clark, executive secretary.

Planning to Build Lime Plant In Arkansas

A PROJECT to build a lime plant near St. Joe, Ark., has been initiated by L. A. Watkins, president of the Missouri & Arkansas Railroad. William S. Brantingham and H. J. Wilkinson of the Lime Products Co., which has plants at Fayetteville, Berryville and Green Forest, also are considering the proposition. The first step will be the construction of a plant to make agricultural limestone which will later be followed by the construction of lime kilns.

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SAN LEANDRO ROCK CO., San Leandro Calif., is planning to rebuild its plant, putting in vibrating screens, rebuilding bunkers, and changing layout for more stockpiling facilities.

Improve Grand Rapids Ready Mix Plant

GRAND RAPIDS GRAVEL CO., Grand Rapids, Mich., has announced the completion of several improvements, according to Henry Battjes, president. A new office building and additional equipment for the heating of ready-mixed concrete have been added. Three new mixing trucks have been purchased, making a total of eight now in the fleet.

Slate Roofing Granule Industry Busy

ARKANSAS SLATE PRODUCTS CO., near Caddo Gap, Ark., is planning to install a new crushing mill for the production of roofing granules. A 5-ton per hour capacity on a 10-hr. basis has been planned. Extensive use of machinery will enable the company to process the slate at a cost of approximately $3 per ton. James M. Williams, Jr., president of the Williams Roofing Products Co., Kansas City, Mo., and general manager of Williams Roofing Co., Little Rock, Ark., is identified with this company as a director. The officers of the slate company are H. Roddy Jones, president, Little Rock, Ark.; C. P. Saviak, director and superintendent of the mill.

Cement Plants Reopen

LONE STAR CEMENT CORP., Bonner Springs, Kans., will reopen on March 1, according to a local statement by Superintendent John O'Callaghan. The first employes will be engaged in making repairs.

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UNIVERSAL ATLAS CEMENT CO., Hannibal, Mo. plant, was scheduled to start up operations the middle of February. An earlier opening date was scheduled, but due to cold weather creating heavy demands for domestic consumption of gas sufficient pressure was not available for the cement plant requirements.

Temporary Shut-downs of Cement Plants

LAWRENCE PORTLAND CEMENT CO., Northampton, Penn. plant suspended operations on February 1, with bins full. Local reports state that extensive improvements will be made during the shut-down.

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ASH GROVE LIME & PORTLAND CEMENT CO., Chanute, Kans. plant has temporarily suspended operations for the purpose of making extensive repairs. It is expected that the plant will reopen some time in March.

Sell Interest In Lime Plant

N. D. WALKER, for 30 years connected with the Southern States Lime Corp., Crab Orchard, Tenn., has sold his one-third interest to Gadsden Smith, Charleston, S. C., president of the company. Mr. Walker plans to devote his time to his sandstone quarry situated four miles east of Crossville, Tenn. Mr. Walker will be succeeded as manager of the lime plant by Doyle Hembree.

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ERIN LIME & STONE Co., Erin, Tenn., has doubled the number of its employes and is working two shifts of men according to a local report. The company has four lime kilns in service.

Marble Cliff To Make Lime At Lewisburg, Ohio

THE MARBLE CLIFF QUARRIES Co., with headquarters at Columbus, Ohio, and large lime and limestone operations at Marble Cliff, a suburb of Columbus, have recently purchased the property of the National Lime and Stone Co., near Lewisburg, Ohio. During recent years, the Lewisburg quarry has been operated as a source of highway and commercial stone, but it is the intention of the new owners to interest themselves in the production of high calcium lime made from the rock taken from the lower strata of the Lewisburg deposit. The upper and overlaying strata of the Lewisburg stone are unsuited for lime and chemical purposes, so it will be necessary to resort to mining to secure a satisfactory grade of limestone.

The lime plant at Marble Cliff is a rotary kiln type, whereas the installation proposed for Lewisburg will be vertical kilns, thereby giving Marble Cliff two types of burned lime for its trade. Present plans call for two vertical kilns of the large capacity type. Victor J. Azbe of St. Louis, has been named as consulting engineer for the new plant, while R. H. Pausch, secretary and R. W. Bowen, production manager, of The Marble Cliff Quarries Co., are in immediate charge of the installation.

Dust Collector For Agstone Plant

THE MARBLE CLIFF QUARRIES Co., Columbus, Ohio, has been very active in recent years in the production of various agricultural liming products, both ground lime and limestone. It also produces many fine limestone products used as a filler for asphalt, rubber tires, powder and dynamite, fertilizers, ready-mixed stock feed, and ingredients for stock tonics. Recently the company installed a complete dust collecting system at a cost of approximately $15,000. Since the installation, there is no dust in the interior, and even in loading railroad cars and trucks outside there is practically no dust.

Gravel Producer to Make Blocks

MASSARO SAND AND GRAVEL Co., Fulton, N. Y., a sand and gravel operator of this city and more recently in the concrete block business, plans to spend $15,000 to modernize its block machinery and plant.

Large Ballast Tonnage

THE CHICAGO, ROCK ISLAND & PACIFIC RAILROAD has announced the approval of the 1940 budget, which provides for the use of 285,000 cu. yd. of track ballast in its track maintenance program for the coming year.

Stone-Asphalt Ballast

NEW YORK CENTRAL railroad is building a stretch of roadbed near Bryan, Ohio, using asphalt mixed with regular crushed rock ballast, in an attempt to reduce roadbed maintenance costs.

Rock Wool Possibilities in Oklahoma

ROBERT H. DOTT, survey director of the Oklahoma Geological Survey, University of Oklahoma, is encouraging establishment of a rock wool manufacturing industry in the State. Investigations have revealed large deposits of stone in the state which may be developed for rock wool, it is reported.

Open New Quarry

KELLY CONSTRUCTION CO., Des Moines, Iowa, has been operating a new quarry near Hopkins, Iowa, with about 25 men employed. Until recently, the capacity was 250 cu. yd. per day, but it is planned to double it. Crushing has all been done with a hammermill to produce a large percentage of fines for agricultural limestone, but to secure a large production a primary and secondary crusher is to be purchased. Crushed rock for road aggregate is trucked to Bedford for use on the new road to the Lake of Three Fires.

Watchmen Covered by Wage-Hour Law

A FEDERAL JUDGE in North Carolina has ruled in a contempt proceeding that watchmen are as much engaged in the production of goods for interstate commerce as those operating the production machinery. The contempt action was against W. B. Coppersmith and Sons, Inc., sawmill operators. Judge Meekins ruled from the bench that "Watchmen are just as much engaged in the production of goods that are going into commerce as the man sawing logs. It would have been cruel of Congress to have legislated otherwise. The watchman not only watched the plant and machinery, but he also guarded the goods that were in the plant for interstate commerce. It is inconceivable that Congress would have discriminated against such a plea by exempting him from the provisions of the Act."

Screen Wire Specification Is Reaffirmed

ANNOUNCEMENT has been made by the Division of Simplified Practice of the National Bureau of Standards that Simplified Practice Recommendation R147-33, Wire Diameters for Mineral Aggregated Production Screens, has again been reaffirmed without change by the Standing Committee of the industry. These diameters, classified as light, standard light, standard heavy, and heavy, are for 21 specific clear screen openings ranging from ⅛-in. to 3-in., inclusive.

New Iowa Agstone Plant

ACME LIME AND STONE CO., New Sharon, Iowa, is opening a quarry on the Fleming farm west of New Sharon to produce crushed and pulverized limestone. Capacity will be 250 to 300 cu. yd. of rock a day with about 150 tons of agricultural stone when the quarry is fully developed. E. D. Wahl is in charge of the development.

Gravel Anti-Trust Case Coming Up In April

PLEAS of not guilty to an indictment charging conspiracy to violate the federal anti-trust law were made by the Long Island Sand and Gravel Producers Association, eight corporations and 12 individual defendants. The case was put over to April 16.

Rock-wool Plant Improvements

THE AMERICAN ROCK WOOL CO. is spending $100,000 improving its plant at Wabash, Ind.

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SUPERIOR INSULATIONS, INC., plans to erect a rock-wool plant at Lagro, Ind.

FINANCIAL NOTES

RECENT DIVIDENDS ANNOUNCED

Consolidated Cement Corp.	$1.00	Mar. 30
National Gypsum Co., pfd.	1.12½	Mar. 1
Ohio River Sand Co., pfd. (arrears Mar. 2, $39.25)	1.00	Mar. 1

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ARUNDEL CORP., Baltimore, Md., has announced through President Jos. V. Hogan that new contracts received since January 1, 1940 total $14,348,376, including 10 percent participation in the Shasta Dam contract, 50 percent in the Upper Narrows Dam contract, and 50 percent in the Naval Air Base contract at San Juan, Puerto Rico.

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ALPHA PORTLAND CEMENT CO., Easton Penn., reported a net income of $747,097 for the year ended December 31, 1939, as against $235,107 in 1938. Net sales were $6,988,706 in 1939 as compared with $6,332,661 in 1938.

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UNITED STATES GYPSUM CO., Chicago, Ill., reports net profits of $7,365,847 for the calendar year 1939. In 1938 net income was $4,725,497. Sewell L. Avery, chairman of the board, told stockholders in his annual report that he looked for a satisfactory level of business for the next few months.

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KENTUCKY STONE CO., INC., Louisville, Ky., had total current assets of $173,403 as of August 31, 1939 as against $248,867 for the same date in 1938. Total assets, including plants and equipment, limestone deposit, etc., amounted to $1,052,175 on August 31, 1939 compared with $1,057,079 on the same date in 1938.

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MISSOURI PORTLAND CEMENT CO., St. Louis, Mo., presented the following income report for the years ended December 31, 1938 and 1939:

	1939	1938
Gross sales	$4,307,713	$3,751,972
Frgt. & discount	943,156	915,139
Net sales	3,364,558	2,836,832
Cost of sales	1,989,548	1,744,628
Sell., etc., exp.	546,059	528,309
Oth. deducts., net	20,233	56,117
Deprec. & deplet.	350,658	336,116
Operating profit	458,060	171,662
Margin of profit	13.61%	6.05%
Income taxes	81,404	37,357
Net income	376,655	134,305
Dividends	353,008	141,203
Surplus for year	23,647	d6,898
Earn. surp., 1-1	1,147,239	1,154,137
Inc. tax adjust.	cr 9,675	
Earn. surp., 12-31	1,180,562	1,147,239

GIANT PORTLAND CEMENT CO., Philadelphia, Penn., showed a net loss of $2872 for the year ended December 31, 1939 as compared with a loss of $100,373 in 1938. Net sales in 1939 were $953,134 as against $694,055 in 1938.

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LAWRENCE PORTLAND CEMENT CO., New York, N. Y., reports the following income statement for the calendar years ended December 31, 1939 and 1938:

	1939	1938
Oper. income	$ 402,786	$ 147,010
Other income	23,892	22,095
Total income	426,678	169,105
Depreciation	250,173	249,538
Depletion	8,804	7,036
Operating profit	167,701	d 87,469
Interest	16,285	39,495
Prem. on deb.	6,425	———
Doubtful accts.	6,297	———
Income taxes	20,800	———
Net income	117,894	d 126,964
Dividends	75,000	———
Surp. for year	42,894	d 126,964
Earn. surp. 1-1	222,642	335,134
Credits	———	14,472
Earn. surp. 12-31	265,536	222,642

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UVALDE ROCK ASPHALT CO., San Antonio, Texas had a net loss of $9517 in 1939 as compared with a loss of $85,020 in 1938.

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PETOSKEY PORTLAND CEMENT CO., Petoskey, Mich., has issued the following consolidated income account for the years ended December 31:

	1939	1938
Net sales	$1,729,684	$1,430,482
Cost of sales	1,109,784	955,943
Sell., etc., exp.	356,123	349,875
Oper. profit	263,777	124,665
Margin of profit	15.25%	8.71%
Other income	10,166	9,843
Total income	273,943	134,507
Interest, etc.	29,414	30,336
Other deducts	8,574	8,158
Prov. for tax	40,154	16,467
Net profit	195,801	79,547
Surplus, Jan. 1	578,753	499,206
Surplus, Dec. 31	774,554	578,753

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MICHIGAN SILICA CO., Rockwood, Mich., had a net profit of $54,401 for the year ended December 31, 1939. This compares with a profit of $37,785 for the same period in 1938. Sales in 1939 totaled $257,314 as against $211,632 in 1938.

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SUPERIOR PORTLAND CEMENT CO., INC., Seattle, Wash., had a net income of $845,569 for the year ended December 31, 1939, compared with $257,661 for the same period in 1938.

(Continued on page 80)

AMERICAN SILICA-SAND CO., Chicago, Ill., with plants at Ottawa and Utica, Ill., reported a net loss of $52,523 for the year ended December 31, 1939 as compared with a deficit of $73,785 in 1938.

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ALBERENE STONE CORP. OF VIRGINIA, New York, N. Y., with plant at Damon, Va., reported a net income of $44,548 for the calender year of 1939 as compared with $15,576 in 1938.

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CERTAIN-TEED PRODUCTS CORP., Chicago, Ill., will have a net profit of slightly over $600,000 for the calendar year 1939, according to estimate of earnings by Bror Dahlberg, president. The profit in 1938 was $171,000.

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WOLVERINE PORTLAND CEMENT CO., Coldwater, Mich., has issued the following income account for the years ended December 31:

	1939	1938
Net sales	$ 596,953	$ 389,788
Cost of sales	422,613	296,618
Selling, etc., exp.	62,030	59,291
Depreciation	38,140	39,667
Operating profit	74,170	d 5,788
Margin of profit	12.42%	
Other income	6,791	
Total income	80,961	5,301
Other deduct.	38,469	7,993
Fed. income tax	8,380	
Net profit	34,112	d 2,692
Deficit. Jan. 1	72,940	71,296
Adjustments	cr 200	cr 1,049
Deficit, Dec. 31	38,628	72,940

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BESSEMER LIMESTONE & CEMENT CO., Youngstown, Penn., has issued the following statement of earnings for the calendar years 1938 and 1939:

	1939	1938
Net sales, etc.	$1,581,875	$1,105,690
Costs & expenses	1,110,544	911,969
Depreciation	171,883	154,741
Oper. income	299,448	38,980
Margin of profit	18.93%	3.53%
Other income	1,113	35,954
Total income	300,561	74,935
Bond interest	43,618	66,677
Other deduct.	27,197	
Fed. income tax	41,354	
Net income	188,392	8,257
Preferred divs.	114,930	
Surp. for year	73,462	8,257
Earn. surp., 1-1	17,924	11,620
Adjustments	8,076	1,953
Earn. surp., 12-31	83,311	17,924
Times int. earned	6.27	1.12
Earn., pfd. share	$7.38	$0.32
No. of pfd. shs.	25,540	25,540

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CASTALIA PORTLAND CEMENT CO., Castalia, Ohio, which has not operated since 1931, will be placed in bankruptcy and its equipment sold. The trustee, Robert R. Gordon, reported an offer of $45,000 for the company's equipment. There is an outstanding mortgage of more than $500,000 on which interest of more than $100,000 is due, and a tax claim of $30,000.

Seasonal Exemption Protest by Crushed Stone

A REQUEST has been filed by the National Crushed Stone Association with the Administrator of the Wage and Hour Law for a review of the finding by Mr. Stein that a part of the sand and gravel industry should have a limited seasonal exemption, based on difficulties of winter operation due to geographical location. The petition further asks for a reopening of the proceedings dealing with the respective applications for seasonal exemption filed by both the National Sand and Gravel Association and the National Crushed Stone Association to present additional evidence. It is discretionary with the Administrator as to whether the request of aggrieved parties for reopening of the hearings will be approved, but if it is approved a public hearing will be held.

Agricultural Limestone in South Carolina

SOUTH CAROLINA farmers purchased 45,814 tons of limestone under the 1939 federal farm program, which is said to be the largest tonnage of agricultural limestone ever used in the State in one year. Most of the limestone was quarried at Creston, Holly Hill and Gaffney. Studies of cultivated fields have shown a high proportion of the soils to be overly acid.

New Gravel Plant

A NEW SAND AND GRAVEL washing plant is reported to have been built northwest of Fort Dodge, Iowa, with a machinery investment of $30,000 and having a daily capacity of 800 tons. Operators of the plant are also considering building a concrete pipe plant.

Diamond Adds to Storage

DIAMOND PORTLAND CEMENT CO., Middle Branch, Ohio, plans a two-story addition, 75- x 115 ft., for storage and distribution facilities. With equipment, the cost will be $40,000.

Concrete Pavement Yardage

AWARDS of concrete pavement for January, 1940, have been announced by the Portland Cement Association as follows:

Type of construction	Square yards awarded during January, 1940
Roads	1,730,187
Streets and Alleys	866,636
Airports	46,101
Total	2,642,924

American Concrete Institute Convention Program

As the meetings of the American Concrete Institute on February 27, 28, and 29 occurred too late in the month to permit publication of a report, a brief outline of the program of particular interest to our industry will be given which will be followed by a report in a later issue.

The subjects and speakers are as follows:

The Design of Concrete Mixes, by Chas. T. Kennedy, consulting engineer, Cincinnati, Ohio; Henry L. Kennedy, Dewey and Almy Chemical Co., Cambridge, Mass.; and W. M. Dunagan, Iowa State College.

Ready-Mixed Concrete Operations in Philadelphia, by Alexander Foster, Jr., Herbert J. Knopel and Herbert J. Whitten, Warner Co.

The Contribution of Ready-Mixed Concrete to the Building Industry, by H. F. Thomson, vice-president, General Material Co., St. Louis, Mo.

Proposed Recommended Practice for Measuring, Mixing and Placing Concrete, by A. C. I. Committee 614, Lewis H. Tuthill, chairman.

Permeability and Acid Test of Silo Staves, by C. A. Hughes, University of Minnesota.

Proposed Specifications and Methods of Testing for Concrete Staves to be used in Farm Silo Construction, by A. C. I. Committee 714, C. A. Hughes, chairman.

Tests on Concrete Masonry Units Using Tamping and Vibration Molding Methods, by Kurt F. Wendt, University of Wisconsin, and Paul Woodworth, P.C.A.

Tests of the Resistance to Rain Penetration of Walls Built of Masonry and Concrete, by R. E. Copeland and C. C. Carlson, P.C.A.

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Sand Lime Brick Production and Shipments

Ten active sand-lime brick plants reporting for January and nine for December, statistics for which were published in February.

AVERAGE PRICE FOR JANUARY

	Plant Price	Delivered Price
Detroit, Mich.	....	$14.50
Grand Rapids, Mich.		14.00
Milwaukee, Wis.....	$10.00	12.50
Mishawaka, Ind.....	10.50	....
Saginaw, Mich.....	10.90	....
St. Louis Park, Minn.	8.00	9.50
Seattle, Wash.....	14.50	16.50
Sebewaing, Mich.....	10.00	....
Syracuse, N. Y.....	14.00	16.00 C/L 20.00 L/C

STATISTICS FOR DECEMBER AND JANUARY

	†December	‡January
Production	1,506,390	800,410
Shipments (rail).....	42,000	72,000
Shipments (truck)...	1,583,110	1,034,220
Stock on hand.....	1,660,619	1,319,591
Unfilled orders.....	250,000	1,010,000

† Nine plants reporting: incomplete, one not reporting production, two not reporting stock on hand, and five not reporting unfilled orders.

‡ Ten plants reporting: incomplete, one not reporting production, three not reporting stock on hand and five not reporting unfilled orders.

Marquette To Build Cement Dock

Marquette Cement Manufacturing Co., Chicago, Ill., has filed application for a permit to construct a cement and stone unloading dock on Wolf River at the foot of Cypress Creek in Memphis, Tenn.

COMING CONVENTIONS

Annual Midwest Power Conference, Palmer House, Chicago, April 9 and 10.

National Concrete Burial Vault Association, Netherland Plaza Hotel, Cincinnati, Ohio, May 7, 8 and 9.

National Industrial Sand Association, The Greenbrier, White Sulphur Springs, W. Va., June 13 and 14.

National Lime Association, Drake Hotel, Chicago, May 21, 22 and 23.

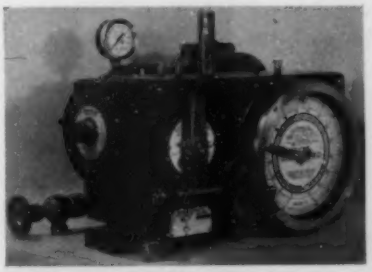
NEW MACHINERY * NEW EQUIPMENT

Controlling Water In Concrete Mixes

AUTOMATIC LIQUID METER CO., Los Angeles, Calif., is now marketing two devices to control water in concrete mixes. They are a meter for accurately measuring the water going into the batch of cement and aggregates, and an hydrometer for quickly determining the moisture of the sand and coarse aggregate. Both of these devices have the trade name of "Repeat-O-Matic."

The illustration, herewith, shows the water control device, and gives some idea as to how it operates. It will be noticed that the water measuring meter has a movable dial calibrated in gallons, pounds or cubic feet which may be adjusted to any desired amount by a quantity setting crank mounted on the rim of the dial. This crank has a double locking device which locks the quantity setting, allows the lever to "start" only, or locks the lever to prevent tampering after working hours. A hand on the dial shows the amount of liquid delivered with an automatic return to zero on completion of the delivery. A stationary pointer at the top of the dial indicates the total quantity setting.

To the left of the dial is the operating lever and multi-control plate



Meter for accurately measuring water going into the batch of cement and aggregates

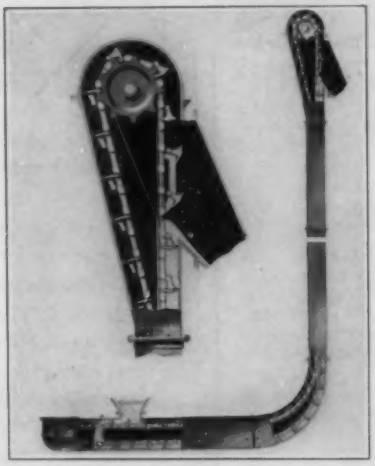
which can be started at "slow" or "full" and can be reduced to "slow" or full stop immediately. The hand will return to zero when the starting lever is pushed to "pointer return" position. A hydraulically operated valve closes automatically when a set quantity of liquid has been delivered.

Other equipment includes: an enclosed strainer and sand trap to prevent entrance of scale or dirt into the meter; an unmetered faucet for cleaning trap and strainer; and a pressure gauge indicating static and running pressures.

The hydrometer, which is marketed as part of the meter equipment, offers a quick method of determining surface moisture of the aggregates in a batch to an accuracy said to be less than one-half of one percent.

Elevator-Conveyor for Granular Materials

THE JEFFREY MANUFACTURING CO., Columbus, Ohio, has developed what is known as the Mass-Flo elevator conveyor. This new unit offers a low-cost and unique method of handling all kinds of light, granular materials.



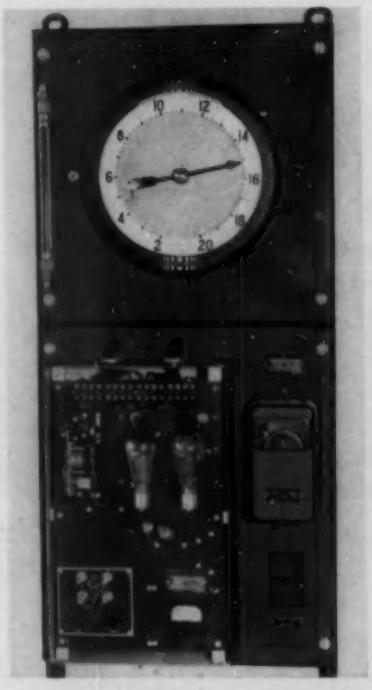
Cut-away sections show the feed and discharge arrangements of the elevator-conveyor. Enlarged view illustrates how flights are discharged by a tripper

The elevator-conveyor is simple in design and construction, consisting of a steel casing through which solid pivoted flight spaced at intervals on a single strand of chain, move the material horizontally or vertically in a solid mass or with partial load. In the accompanying illustration, the enlarged view of the discharge point shows how the flights are discharged of their load by means of a tripper. Since each flight carries a full or partial load, depending upon rate of feed, the elevator-conveyor can be emptied after feed stops.

Fed or discharged at any point, the elevator-conveyor handles material with very little agitation, thus breakage and degradation are practically eliminated. It is self-feeding and self-cleaning.

Automatic Control for Electric Heaters

GENERAL ELECTRIC CO., Schenectady, N. Y., has developed a system for automatically regulating the power



New control system automatically regulates power input to electrically heated equipment

input to electrically heated equipments, such as furnaces, boilers, superheaters, and air heaters. Called the Reactrol system, this new means of control regulates power input by varying the voltage impressed on the heating resistors in accordance with temperature or pressure requirements. It is particularly suitable for continuous processes and in the treatment of materials that might be affected by slight changes in temperature.

In its simplest form, the Reactrol system consists of a control panel, a temperature or pressure control instrument, and a saturable-core reactor. In operation, the pressure or temperature control instrument (which contains a special potentiometer) feeds low-voltage current into an amplifying tube on the control panel. This tube, in turn, regulates the flow of direct current to the saturable-core reactor which, act-

NEW MACHINERY

ing like a valve, regulates the voltage applied and thus the amount of power going to the electric heating equipment.

Vibrators and Controllers

THE SYNTRON COMPANY, Homer City, Penn., has added to their line of vibrators, an "Explosion Proof" model,

Vibrator for use where atmospheric conditions are highly inflammable or explosive

for use in plants where atmospheric conditions are highly inflammable or explosive. The vibrator, a heavy, pulsating electro-magnet, is fully encased in a thick, electric-furnace steel case, with ground joints, and with an armored cable lead. The remote electric control panel, containing a rectifier, operating switches and rheostat for controlling the vibrator's power, is fully encased in a cast iron case, with ground joints and approved explosion proof fittings.

Vernier-Control Variable Speed Transmission

LINK-BELT CO., Philadelphia, Penn., has announced that it is now in position to equip all sizes of its P. I. V. gear variable speed transmission

Fine control of speed changes with vernier control on variable speed transmission

with vernier control for installations where extremely fine control of speed changes is required. The vernier control can be supplied with either one of two ratios, 7½ to 1 or 30 to 1, and is equipped with two hand wheels. One is for direct control; the secondary, or vernier type control hand wheel will provide either 30 turns or 7½ turns to one of the direct wheel, depending upon which ratio of worm-gear reduction set is furnished. This control provides for micrometer adjustments of speed in synchronizing the speeds of two machines and for controlling feeders and weighing operations.

Tractor Speeds Up Hauling Operations

ALLIS-CHALMERS MANUFACTURING CO., Milwaukee, Wis., has brought out a low, short, compact and powerful tractor known as the Model IB. With 13.5 drawbar horsepower, and weighing 2140 lb., this unit is said to speed up hauling operations and cut material handling costs. Because this model sets low on the ground, it has the necessary stability to haul up and down inclined ramps without tipping. It has both a foot brake and individual hand brakes on the

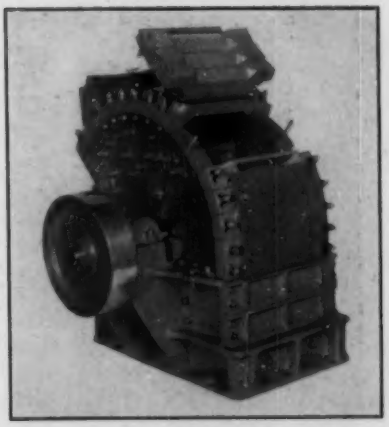
Tractor built low, short and powerful to handle all types of industrial work

rear wheels to facilitate maneuvering in cramped quarters, and has three forwards and a reverse.

For power, this model has the 18 hp. heavy duty, medium speed tractor engine used in the well-known Model B tractors. The valve-in-head engine has removable cylinder liners, a foot-controlled governor, and is protected by oil, air and fuel filters. Fuel consumption is said to be less than one gallon per hour.

Impact Breaker

THE IOWA MANUFACTURING CO., Cedar Rapids, Iowa, has announced their "Kubit" impact breaker, which was displayed for the first time at the 1940 Road Show in Chicago. This machine is said to produce a cube-shaped product for road and concrete aggregate from any type of stone available. Breaking is done entirely by impact and no crushing or

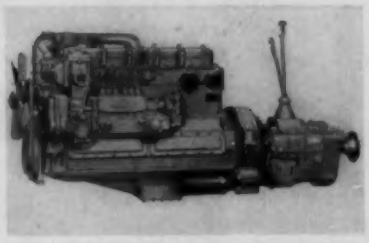


Crusher of impact type which is said to produce a cubical product

grinding action is employed. It is claimed that this principle of crushing causes the stone to split along its natural grain and thereby reduce the amount of splinters and sharp edge rock produced. Wearing parts can be quickly and easily changed. The machine operates at comparatively low speeds and low horse power for large output.

Ninety Horsepower Diesel Truck Engine

CATERPILLAR TRACTOR CO. has designed and recently placed on the market a 90-hp. Diesel truck engine,



Six-cylinder, four-stroke, valve-in-head, water-cooled Diesel engine equipped with five-speed transmission

representing the first entry of this company into the automotive field. The engine is a six-cylinder, four-stroke, valve-in-head, water-cooled model with a bore of 4¼ in. and a 5½-in. stroke. Maximum horsepower is developed at 1800 r.p.m., and maximum torque is 305 ft. lb. at 900 r.p.m. Piston displacement is 468 cu. in. The engine fuel system features solid injection into precombustion chambers. Water circulation is by pump, and an air-cooled type lubricating oil cooler is provided. There are seven main crankshaft bearings with a crankshaft torsional vibration damper.

Gardner-Denver UMB Drills Help Move 18,000 Yards of Gypsum Rock . . . Only One Minor Repair

That's only one example of the service you can expect from a Gardner-Denver UMB Universal Mounting Rig. On job after job, they've proved their ability to stand up to the tough requirements of quarry operation—to operate economically—with a minimum of upkeep.

PROFIT FROM THE EXPERIENCE OF OTHERS!

ROCK production goes up when you buy a Gardner-Denver Wagon Drill! That's been *proved* time and again on the job. Experience records show that their double barrel savings mean extra profits for you. Low on air consumption—these drills are low on upkeep, too. Long hours of uninterrupted service are usual with Gardner-Denver Drills because they are built to give more footage per shift—*every* shift. We shall be glad to send you free bulletin showing you how to get your rock out faster—cheaper with Gardner-Denver Wagon Drills. Write Gardner-Denver Company, Quincy, Illinois.

Gardner-Denver WDS Wagon Drills Show Profit on the Widest Range of Jobs

Quarry operators find drilling deeper holes is easier—more efficient with Gardner-Denver WDS Wagon Drills. A WDS will handle a ten-foot change of steel and drill in any position from 9° above the horizontal to vertical. Put them to work in your quarry—and watch the rock move out—fast.

GARDNER-DENVER
SINCE 1859

Move Material the Easy Way "By Controlled Vibration"

Hydrated Lime Bins in Glass Plant Fitted with 125 lb. Vibrators

Blending Three Materials in Zinc Refinery with One Small and Two Large Feeders

Pulsating Electro-magnet Vibrators

Make the most stubborn bins and chutes flow freely.

8 models—ranging from 4 lbs. to 500 lbs. in weight.

Each with separate power control panel.

Pulsating Electro-magnet Vibratory Feeders

Provide rheostat control of volume flow of bulk materials, to grinders, mixers, dryers, screens, etc.

From pounds to tons per hour.

"Vibra-Flow"
Constant Weigh Feeders

SYNTRON COMPANY
450 Lexington Ave., Homer City, Pa.

COLMONOY NO. 1

18 Yd. bucket for handling limestone. Teeth Coated with Colmonoy No. 1, electric application.

Colmonoy No. 1 is a flux-coated general purpose hard facing electrode, of medium high carbon steel core with flux coating of Colmonoy Crystals. It is particularly valuable in building up large sections of thick overlay, where a smooth finish is not necessary. It may be applied with oxy-acetylene flame if desired. It is at maximum hardness when deposited, and resists wear without further treatment.

Its attractive price and high resistance makes Colmonoy No. 1 the most economical hard facing material for building up Dipper Teeth, Shovel Teeth, Bucket Lips, Drag Chains and other equipment where the hard facing must withstand severe, sudden shock and abrasion without chipping or breaking off.

Write for Catalog No. 72

New, 1940 catalog covers all Colmonoy Hard Facing Alloys. Includes directions for applying Colmonoy No. 1 either electrically or with the torch. Write today.

COLMONOY
WALL-COLMONOY CORP.
Sixth Floor, Buhl Bldg., Detroit, Mich.

3155 Seneca St., Buffalo, N. Y. 2054 W. Harrison St., Chicago, Ill.
558 W. 54th St., New York, N. Y.
123 W. Philadelphia St., Whittier, Cal.

OBITUARIES

JAMES D. KIRKPATRICK, SR., founder of the Kirkpatrick Sand and Cement Co., Birmingham, Ala., died February 7 at the age of 78. He had disposed of his holding in the Kirkpatrick company several years ago and was president of the Cruse-Crawford Manufacturing Co., at the time of his death.

•

ARTHUR V. VANNEMAN, president, general manager and purchasing agent of the Tyrone Lime and Stone Co., Tyrone, Penn., died February 8.

•

DANIEL FRANCIS RODDY, proprietor of Roddy's lime kilns, Emmitsburgh, Md., died January 5 at the age of 83. For more than 40 years he has been producing lime and supplying stone for road and general construction, and recently agricultural limestone, to the communities adjoining Emmitsburgh.

•

LOUIS F. KLINE, founder and operator of the La Grande Concrete and Supply Co., La Grande, Wash., died January 27. He also was founder and for many years operator of the Walla Walla Concrete Pipe Co., Walla Walla, Wash.

•

HARRY W. SIEGER, of Lehigh County, Penn., an old-timer in the cement industry, died January 21 at the age of 62. He entered the employ of the American Cement Co. at Egypt in 1892, and continued with that company and its successor, the Giant Portland Cement Co., until his death, having been the company's office manager at Egypt in recent years.

•

PAUL E. CHALIFOUX, part owner and vice-president of the Kirkpatrick Sand & Cement Co., Birmingham, Ala., died January 17 at the age of 59.

•

ROBERT ALLEN PATTERSON, president and treasurer of the National Lime and Stone Co., Findlay, Ohio,

Robt. A. Patterson

from 1927 to 1932, died January 27 at the age of 78. He had been associated with the crushed stone business for about 55 years.

•

JOHN EVANS DONELSON, engineer and pioneer in the ready-mixed concrete industry, died at Birmingham, Ala., December 30 at the age of 68.

•

JOHN J. FASMER, until recently general sales manager of Stephens-Adamson Mfg. Co., died February 3 at the age of 56. A few months ago he was forced to give up this position because of illness but took charge of special promotional projects.

BUYERS' FREE SERVICE

RESEARCH SERVICE DEPARTMENT, *Rock Products*, 309 West Jackson Blvd., Chicago, Ill.
We are in the market for and would like to receive prices and literature on the items checked below:

....Admixtures
....Aerial Tramways
....Aggregates (Special)
....Agitators
....Air Compressors
....Air Separators
....Architectural Trimstone Molds
....Ash Receptacle Molds
....Ash & Refuse Handling Equipment
....Asphalt Mixing Plants
....Backdiggers
....Backfillers
....Bags
....Bagging Machines
....Balls (Grinding)
....Barges
....Batchers (Weighing)
....Bearings
....Belting (Conveyor & Elevator)
....Bins (Storage)
....Blasting Supplies
....Block Machines, Building
....Boats
....Brick Machines & Molds
....Buckets
....Building Tile Machines
....Bulk Cement Batching Plants
....Bulk Cement Storage Plants
....Bulldozers
....Bullscrapers
....Burial Vault Forms
....Calcining Equipment
....Calcium Chloride
....Cars (Industrial)
....Catch Basin Block Machines
....Cement Plants
....Cement Colors
....Cement Process
....Central Mixing Plants (Concrete)
....Chimney Block Machines & Molds
....Clarifiers
....Classifiers
....Coal Pulverizing Equipment
....Concentrators
....Concrete Mixers
....Concrete Paints & Coatings
....Concrete Waterproofing & Dampproofing
....Conveyors
....Conveyor Idlers and Rolls
....Coolers
....Corn Crib Block and Tile Machines
....Correcting Basins
....Cranes (Crawler & Locomotive)
....Crushers
....Crushing & Screening Plants (Portable)
....Culvert Pipe Machines & Molds (Concrete)
....Curing Equipment
....Curb Forms (Concrete)
....Deduaters
....Dehydrators
....Derricks
....Dewatering Equipment
....Dippers & Teeth
....Disintegrators
....Dragline Cableway Excavators
....Drain Tile Machines
....Dredges
....Dredge Pumps
....Drills (Rock)
....Drill Bits
....Drill Sharpening Machines
....Drill Steel
....Dryers
....Dust Collecting Systems
....Dust Precipitators
....Dust Recovery Plants
....Dynamite
....Electric Motors
....Electrostatic Separators
....Elevators
....Engineering Service (Consulting & Designing)
....Engines (Diesel, Gasoline, Steam)
....Feeders
....Fence Post Molds & Machines (Concrete)
....Floor Tile Machines (Concrete)
....Garbage Receptacle Molds (Concrete)
....Garden Furniture Molds (Concrete)
....Generators & Motor Generator Sets
....Greenhouse Bench Forms (Concrete)
....Guns (Hydraulic)
....Gutter Block Machines (Concrete)
....Hoists
....Hoppers
....Hose
....Hydrators (Lime)
....Joist & Slab Machines (Concrete)
....Kilns (Rotary, Shaft, Vertical)
....Laboratory Apparatus
....Laundry Tub Molds (Concrete)
....Light Post & Standard Forms
....Lime (Hydrated)
....Lime Handling Equipment
....Lime Plants
....Lime Putty Plants
....Loaders
....Locomotives
....Mills (Ball, Compartment, Emery, Hammer, Rod, Roll, Tube)
....Mortar Mixers
....Pallets (Steel, Wood)
....Pans, Grinding (Wet & Dry)
....Perforated Metal
....Pipe Molds and Machines (Concrete)
....Pipe
....Plaster Mixers
....Pontoons
....Pulverizers
....Pumps (Pulverized Material)
....Railway Equipment
....Rectifiers
....Recuperators
....Refractories
....Rewashers (Screw)
....Rock Wool Cupolas
....Roofing Tile Machines
....Sand Drags
....Sand & Gravel Plants
....Sand Lime Brick Machinery
....Sand Settling Tanks
....Scales
....Scrapers (Power Drag)
....Screens (Revolving, Vibrating, Etc.)
....Seal Rings
....Septic Tank Molds (Concrete)
....Sewer Pipe Machines (Concrete)
....Shale Planers
....Shovels (Power)
....Sidewalk Forms
....Sill Forms (Concrete)
....Silos (Storage)
....Silo Stave Machines
....Slakers (Rotary)
....Slurry Mixers
....Slurry Pumps
....Slurry Separators
....Slurry Thickeners
....Step Forms (Concrete)
....Tampers (Hand & Power)
....Tanks (Storage)
....Tractors
....Trucks (Agitator)
....Trucks (Dump)
....Trucks (Industrial)
....Trucks (Mixer Body)
....Unloaders
....Unloaders (Boat)
....Unloaders (Box Car)
....Wagons (Dump)
....Wall Forms & Machines (Concrete)
....Washers (Sand, Gravel & Stone)
....Welding & Cutting Equipment
....Well Curbing Machine & Molds (Concrete)
....Wire Cloth
....Wire (Copper, Iron & Steel)
....Wire Rope

Firm Name _____
Individual _____ *Title* _____
Address _____
City _____ *State* _____

Announce Minimum Wages In Cement Industry

MINIMUM WAGES for the cement industry have finally been determined by the U. S. Department of Labor, Division of Public Contracts. This determination of wage scales covers all companies manufacturing portland cements, including modified portland cement, such as portland masonry cement and portland-puzzolan cement.

The regions and minimum wages are as follows:

(1) Within the States of Pennsylvania, New York, New Jersey, Maryland, West Virginia, Ohio, Delaware, Massachusetts Connecticut, Rhode Island, Vermont, New Hampshire, and the District of Columbia, 57c an hour or $22.80 per week of 40 hours;

(2) Within the State of Maine, 50c an hour, or $20.00 per week of 40 hours;

(3) Within the States of Michigan, Indiana, and Kentucky, 50c an hour, or $20.00 per week of 40 hours;

(4) Within the State of Illinois, 63½c an hour, or $25.40 per week of 40 hours;

(5) Within the States of Wisconsin, Minnesota, Iowa, and Missouri, 55c an hour, or $22.00 per week of 40 hours;

(6) Within the States of South Dakota, Nebraska, Kansas, and North Dakota, 50c an hour, or $20.00 per week of 40 hours.

Slag Association Elects Officers

AT THE twenty-second annual meeting of the National Slag Association, held February 15 and 16 at the Raleigh Hotel in Washington, D. C., the directors elected the following officers for the year 1940: President, George A. Mattison, Jr., Woodstock Slag Corporation, Birmingham, Ala.; vice-president, L. E. McDermut, Illinois Slag and Ballast Co., Chicago, Ill.; managing director and treasurer, H. J. Love, Washington, D. C.; and secretary, T. E. Sheafer, Washington, D. C.

Federal Inquiry Covering Gypsum Products

AS PART OF THE FEDERAL INQUIRY into building costs, Attorney General Jackson has announced that 12 of the leading national producers of gypsum products have been subpœnaed to appear before a special grand jury.

•

DRESSER SAND CO., Leavenworth, Kan., is building a new dredge for excavating sand.

New Incorporations

Concrete Products Co., Dubuque, Iowa, has been incorporated with a capital of 100 shares no par value. U. S. Lewis, Jr., is president.

Bloomington Crushed Stone Co., Inc., Bloomington, Ind., has been incorporated by Ralph Rodgers, Harry L. Berry, and Frank Dobson.

Allstate Sand & Gravel Co., Inc., 203 New Boston Street, Woburn, N. Y., has been granted a charter with 100 common shares, no par value. Mary Corea, Nicola Catizone and Salvatore Talarico are incorporators.

Canton Sand & Gravel Co., Inc., Canton, Mass., has been granted a charter with 10 common shares, no par value. John Kazanjian is president and treasurer; Oscar Talanian and Leona B. Scully are clerks.

Preferred Sand & Stone Co., Inc., Port Washington, N. Y., has been granted a charter with a capital of 100 shares no par value. Incorporators are Horowitz & Horowitz, Herbert Ave., Port Washington.

Maury-Williamson Phosphate Co. is the name of a new Nashville, Tenn., corporation. Incorporators are Curtis B. Dahl, Laurence B. Howard, J. T. Ward and J. F. Eggleston. The charter provides for 100,000 shares of 6 percent preferred stock of $5 value and 250,000 shares of common stock at $1 par value. Only 75,000 shares of the preferred and 200,000 of the common are to be issued immediately.

L. Lordi Sand & Gravel Corp., Westbury, N. Y., has been granted a charter with a capital of $10,000. Incorporator is Meyer Wilen, 135 Northern Blvd., Flushing, N. Y.

State Sand & Stone Co., Inc., Manhattan, N. Y., has been granted a charter. Capital is $100,000 and agent is Wickes, Nelson & Rihdel, 60 Broadway, New York.

Pennington Quarry Co., Elizabeth, N. J., has been incorporated with a capital of 5000 shares, no par value. Agent is Melvin J. Koestler.

N. E. Sand & Gravel Co., Inc., has been granted a charter. It is capitalized at $50,000 in 500 shares at $100 a share. Frank Generazio is president and treasurer and Jacob Leader is clerk.

Calcibrite Corp., 84 State St., Boston, Mass., has been granted a charter to deal in gypsum products with a capital of 24,000 shares, no par value. Joseph F. Knowles, Jr., is president; Richard M. Nichols is treasurer and clerk; and Elsie H. Lofgren is a third incorporator.

Manufacturers' News Notes

Dewey & Almy Chemical Co., Cambridge, Mass., is to erect a new Chicago plant at Stickney township, Ill. The first unit, to provide about 30,000 sq. ft. of floor space, will cost approximately $125,000.

Cooper-Bessemer Corp., Mt. Vernon, Ohio, has opened a new sales office in St. Louis, Mo., located in the Arcade Building, and appointed W. S. Arthur as head.

John A. Roebling's Sons Co., Trenton, N. J., announces that Edward D. Emerson has been appointed general manager of sales. He has been a district sales manager with Babcock & Wilcox Tube Co., since 1937.

Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc., Passaic, N. J., recently reported the death of Colonel Arthur Farragut Townsend, chairman of the board of Raybestos-Manhattan, Inc., and general manager of the Manhattan Rubber Mfg. Division, at the age of 74. He helped organize the Manhattan Rubber Mfg. Co. in 1893 and was made president in 1903.

Babcock & Wilcox Tube Co., New York, N. Y., announces that W. W. Williams, general manager, has relinquished his position to go into business for himself on the Pacific Coast. A bronchial condition necessitates his moving.

Buckeye Traction Ditcher Co., Findlay, Ohio, has appointed Paul B. Cochran as general sales manager.

Timken Roller Bearing Co., Canton, Ohio, has appointed M. H. Kuhl assistant manager of the industrial division. This position was formerly held by S. D. Partridge, who was recently made manager of the industrial division.

Linn Manufacturing Corp., Morris, N. Y., announces the election of E. D. Herrick as president.

Allis-Chalmers Mfg. Co., Milwaukee, Wis., announces the appointment of Fred E. Haker as general manager of purchases.

Iron & Steel Products, Inc., Chicago, Ill., announce the establishment of a merchant iron and steel department under the direction of J. C. Beggs, formerly of Joseph T. Ryerson & Sons, Inc.

Hercules Powder Co., Wilmington, Del., has appointed F. George Trescher manager of the San Francisco office and R. W. McKee, manager of the Birmingham, Ala., office.

Buda Co., Harvey, Ill., appointed D. C. Peterson as plant manager in charge of all manufacturing operations, succeeding E. D. Conant who recently resigned from his position as vice-president in charge of manufacturing.

Cummins Engine Co., Columbus, Ind., has opened an ultra-modern air conditioned sales and service office in Minneapolis at 2350 University Avenue.

W. W. Sly Mfg. Co., Cleveland, Ohio, reports that C. W. Barnes has joined the company to take charge of sales promotion and advertising.

HERE'S WHY IT PAYS TO TRADE THAT *OLD* SHOVEL!

Even with the best old-fashioned excavator, your costs can't compare with the economies made possible through the use of a modern, speedy and efficient P&H machine — fastest of its type on the market. Here's all-around economy that's just as important whether you use your shovel 50 or 350 days a year! With alloy rolled steel, welded construction, tractor-type crawlers and split-second control, P&H machines meet today's needs.

P&H EXCAVATORS

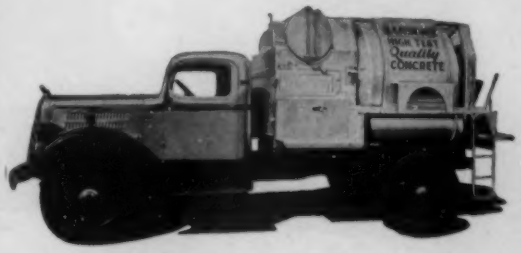
Sizes up to 5 cubic yards. Ask for bulletin on size which interests you.

General Offices: 4465 West National Ave., Milwaukee, Wisconsin

HARNISCHFEGER CORPORATION

EXCAVATORS • ELECTRIC CRANES • ARC WELDERS P&H HOISTS • WELDING ELECTRODES • MOTORS

DO YOU WISH TO PRODUCE A HIGHER QUALITY CONCRETE



and at no additional expense? Then allow us to prove to you beyond any question of a doubt how the patented mixing action of a

Ransome

1940 TRUCK MIXER

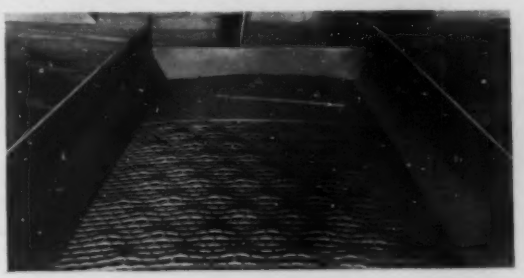
will not only produce a superior mix but greatly increase the number of trips per day.

Send for the Facts

RANSOME CONCRETE MACHINERY CO.
DUNELLEN NEW JERSEY

THE CORRUGATIONS

IMPROVE THE SCREENING



Examine a piece of Hendrick Double Corrugated Plate. Note the irregular surface—the little peaks and valleys that tumble and sift the particles—preventing the material from sliding over the plate too rapidly and insuring better screening.

Add the advantage of Hendrick High Carbon Steel, heat treated for greater resistance to abrasion and longer wear, and you have a double reason for specifying Hendrick Double Corrugated Plate for your next vibrating screen order.

HENDRICK MANUFACTURING CO.

47 Dundaff St., Carbondale, Pa.

SALES OFFICES IN PRINCIPAL CITIES
PLEASE CONSULT TELEPHONE DIRECTORY

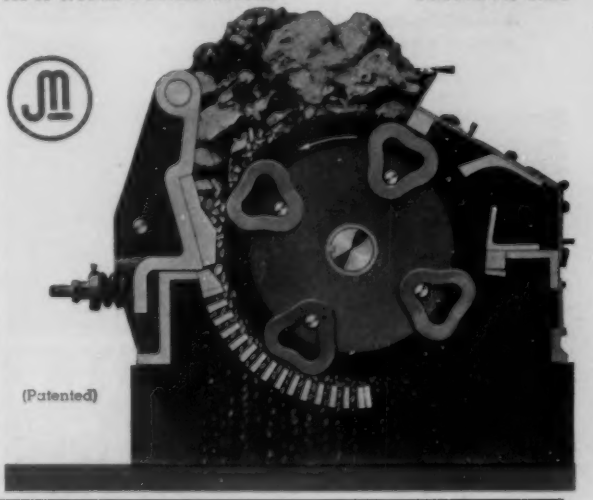
Makers of Elevator Buckets of all types, Mitco Open Steel Flooring, Mitco Shur-Site Treads and Mitco Armorgrids. Light and Heavy Steel Plate Construction.

MANY YEARS OF DEPENDABLE SERVICE . . .

Jeffrey crushers, pulverizers and shredders will give you many years of economical and dependable service. The rotary ring type crusher (illustrated) is designed especially for reduction of shale, lime, cores and many other similar materials. Has renewable steel rings, all-welded steel frame, roller bearings and other features to provide genuine utility and low cost performance. Write Now.

Reduction Division

THE JEFFREY MANUFACTURING COMPANY
935-99 NORTH FOURTH STREET COLUMBUS, OHIO



(Patented)

Traffic and Transportation

PROPOSED RATE CHANGES—The following are the latest proposed changes in freight rates up to and including the week of February 17:

Central

61130. **Limestone**, ground or pulverized, unburnt, min. wt. 60,000 lb. Establish rate of 182c per net ton from Speed, to King (Gibson Co.), Ind.

61152. (a) **Sand** (except industrial) and **gravel**, in open top equipment, C. L. (see Note 6). (b) **Sand** (except industrial) and **gravel**, in closed equipment, C. L., from Madison, O., to Alloy, W. Va., 275c net ton.

61164. **Granite, crushed stone, crushed or broken, rip rap, screenings**, C. L. Establish rate of 198c per net ton from Chicago, Ill. (when originating in Trans-Mississippi River territory), to Detroit, Mich.

61156. **Slag**, granulated or crushed. Establish rate of 270c per net ton from Gary, Indiana Harbor, Ind., and South Chicago, Ill., to New Ulm, Minn.

61190. (1) **Lime**, common, hydrated, quick or slaked, in bags, barrels, casks, iron drums, or in bulk, C. L. Establish on from Quincy, Ill., to Dover, O. (a) 24c, (b) 19c; to Wurtemburg, Penn. (a) 25c, (b) 20c; from Hannibal, Mo., to Dover, O. (a) 25c, (b) 20c; from Marblehead, Ill., to Dover, O. (a) 24c, (b) 19c; to Wurtemburg, Penn. (a) 25c, (b) 20c. (a) C. L., min. wt. 30,000 lb. (b) C. L., min. wt. 50,000 lb.

Note 1—Minimum weight marked capacity of car.

Note 2—Minimum weight 90% of marked capacity of car.

Note 3—Minimum weight 90% of marked capacity of car, except that when car is loaded to visible capacity the actual weight will apply.

Note 4—Reason: No present or prospective movement.

Note 5—Reason: Comparable with rates from other origins in immediate vicinity.

Note 6—Rates will not apply on shipments in cars with tarpaulin or other protective covering. In such instances the rates applicable on shipments in box cars are to be assessed.

Note 7—The oil, tar or asphaltum not to exceed 10% of weight of the commodity shipped, the shipper to so certify on shipping order or bill of lading.

61193. (1) **Sand**, all kinds, as described in Item 200 of C. F. A. L. Trf. 575. Cancel rates 473c, 520c, 473c per net ton from Yonkers, N. Y., to Millington, Oregon, Ottawa, Sheridan, Utica and Wedron, Ill. Classification basis to apply.

61199. **Sand**, C. L. (a) Sand, naturally bonded molding, in all kinds of equipment, sand (except industrial), in closed equipment. (b) Sand, ground or pulverized, in all kinds of equipment. (c) Sand (except industrial), in open top equipment (see Note 6). Establish on, from Ottawa-Utica, Ill., district to Montague, Mich. (a) 231; (b) 254; (c) 220c per net ton.

61208. **Lime**, agricultural, common, hydrated, quick, slaked or fibered, in C. L. Establish on from Buffalo, N. Y., to Waukegan, Ill., (a) 23c, (b) 18c. (a) 30,000 lb., (b) 50,000 lb.

61211. **Sand, all kinds, and gravel**, in open top cars, C. L. Establish on, from Gravel Pit, O., to Beaumont and Logan, O., 105c; Creola, 116c; Dundas and Haydenville, 110c; Kanauga, O., 127c per net ton.

61309. **Limestone dust**, C. L., min. wt. 40,000 lb. Cancel Item 780, C. F. A. L. Trf. 155-U, publishing rate of 23c on, from Piqua, Ohio, to Madison, Wis. Basis 60 percent of sixth class (17c), published in Item 7350 in C. F. A. L. Trf. 130-Z.

61332. **Limestone**, ground or pulverized, unburnt, C. L., min. wt. 60,000 lb. (a) Amend Items 2648 to 2662, inclusive, of CFAL Trf. 400-O, naming rates on, from Mosher and St. Genevieve, Mo., to various points in C. F. A. territory by providing therein for following changes, viz.: 1. Establish rates from Mario, Mo., to destinations involved, the same as now applicable from Mosher and Ste. Genevieve, Mo. 2. Establish rate of $3.58 per net ton to Saginaw, Mich., from all origins. (b) Amend CFAL Trf. 218-L,

naming commodity rates from points in C. F. A. territory to points east of W. T. of E. T. L. by establishing therein on limestone, ground or pulverized, unburnt, C. L., min. wt. 60,000 lb., the following rates, viz.: From Mario Mosher and Ste. Genevieve, Mo., to New York, N. Y., 583c and Philadelphia, Penn., 567c per net ton.

61333. **Limestone** ground or pulverized, unburnt, min. wt. 60,000 lb. Establish rate of 176c per net ton from Greencastle, Ind., to Gibson City, Ill.

61347 (1). **Crushed stone,** in open top cars. Establish rate of 61c per net ton on, from Logansport and Kenneth, Ind., to Valparaiso, Ind. (b) **Sand and gravel,** in open top cars, from Kenneth, Lake Clecott, Winona Lake and Wolcottville, Ind., to Valparaiso, Ind., 61c per net ton.

61392 (2). **Dolomite,** roasted (refractory dolomite in granulate form) treated or untreated, clinkered or burned to a dead state, min. wt. 60,000 lb. Establish rate of 20c from northwestern Ohio group 1 origin to Sault Ste. Marie, Mich.

61519. **Industrial sand,** as per usual descriptions of (a), (b) and (c). Establish on, from Hopkins Park, Ill. (Rates in cents per net ton to Chicago, Ill.—(a) 132; (b) 145; (c) 99; to Milwaukee, Wis.—(a) 176; (b) 194; (c) 138; to Rock Island, Ill.—(a) 198; (b) 218; (c) 160; and to Indianapolis, Ind.—(a) 176; (b) 194; (c) 138.

Trunk

Sup. 2 to 38398. **Limestone,** crude, fluxing, foundry and furnace, in bulk, in open top equipment, C. L. (See Note 3), but not less than 80 000 lb., to Worcester, Mass., from Cedar Hollow, Penn., Group (Reading Co.), $3.08 per net ton, and from Annville, Penn., Group (Reading Co.), $3.19 per net ton.

38444. **Sand** (other than industrial) and **gravel,** in open top cars, without tarpaulin, or other protective covering, C. L. (see Note 3), from Baltimore stations to Antietam, Md., $1.43 per net ton. (See Note 5.)

38445. **Lime,** common, hydrated, quick or slaked, C. L., min. wt. 30,000 lb., to Baltimore (Canton), Md., from Chemical, Bellefonte and Pleasant Gap, Penn., $2 per net ton and from York, Penn., $1.40 per net ton, rates to apply on shipments to be forwarded by water to points beyond and will not include delivery by barge or lighter to connections. (See Note 5.)

Sup. 2 to 38445. **Lime,** common, hydrated, quick or slaked, C. L., min. wt. 30,000 lb., to Baltimore (Canton), Md., from points in Cedar Hollow District, viz.: Bridgeport, Cedar Hollow, Cold Point, Exton, Howellville, Mill Lane, Plymouth Meeting, Shainline, Swedeland and Williams, Penn., $1.60 per net ton, and from points in Lebanon Valley District, viz.: Annville, Avon, Lebanon, Myerstown, Palmyra and Swatara, Penn., $2.20 per net ton, to apply on shipments to be forwarded by water to points beyond and will not include labor or delivery via barge or lighter to connections. (See Note 5.)

38497. **Limestone,** crushed, C. L., only in open top equipment (See Note 3), from Greer, W. Va., to Jones Mills, Penn., 99c per net ton, in lieu of current sixth class rate of 16c per 100 lbs. (See Note 5.)

Southern

21071. **Sand,** C. L. Establish 100c net ton, Edgar, Fla., to Fernandina, Fla. Water competitive. Expires 12-3-40.

21354. **Phosphate rock,** C. L. Establish 75c gross ton, Swift, Fla., to East Tampa, Fla.

21373. Establish from Atlanta, Ga., to Eldorado, Ill., on **stone,** C. L., as described in S. F. T. B. Tariff 285-C, viz.: Item 200, 23c; Item 205, 29c; Item 210, 37c; Item 215, 46c cwt.

21450. **Phosphatic sand or clay,** C. L. Establish to Jacksonville, Fla., from Calphos, Fla., 151; Clark, Fla., 124; Dunellon, Fla. 146; Felicia, Fla., 124; Hernando, Fla., 151; Inverness, Fla., 151; Johns, Fla., 151; Neals, Fla., 124; Newberry, Fla., 124; Rainbow Falls, Fla., 146c net ton.

21452 (carrier). **Mica wet ground,** L. C. L., in lots of 10,000 lb. or more. Establish 60c cwt., Sprucepine, N. C., to Gadsden, Ala.

21494. **Granules, roofing,** C. L., min. 80,000 lb. Establish 550c net ton, Fairmount and Bolivar, Ga., to Dallas, Tex.

21596. **Crushed stone,** C. L. Establish 90c net ton—Stockbridge, Ga., to Athens, Ga. Truck competitive.

21614. **Phosphatic sand or clay,** C. L. Establish 200c net ton, Mulberry and Prairie, Fla., to Ft. Pierce, Fla.

Illinois

IRC 7429-3. **Moulding sand,** C. L. (See Note 3), but in no case less than 40,000 lb., from Arenzville, Ill., to Ottawa, Ill. Present, $2.18 net ton; proposed, $1.53 net ton.

IRC 8616-1. **Sand, core,** C. L. (See Note 3), except from Van's Siding, Ill., to Chicago, Ill. Present—$1.10 net ton. Proposed—99c net ton.

IRC 8616-2. **Core, sand,** C. L. (See Note 3), from Van's Siding, Ill., to the following Illinois points ("A" refers to present, "B" to proposed): Rock Island, A, $1.43; B, $2.35; Moline, A, $1.43; B, $2.35; East Moline, A, $1.43; B, $2.35; Davenport Ia., A, $1.43; B, $2.35.

IRC 8958. **Stone,** viz.: stone, ground or pulverized, crushed or quarried; also strippings of stone quarries, in straight or mixed C. L. (See Note 3), but not less than 40,000 lb., except as otherwise specifically provided, from Prairie du Rocher, Ill., to the following Illinois points. ("A" refers to present rate, "B" to proposed.) Valley Jct. (A) 69, (B) †37; Dupo (A) 69, (B) †40; Menard (A) 77, (B) 50; Thebes (A) 105, (B) 88; Murphysboro (A) 88, (B) 77; Hafer (A) 94, (B) 88; Mt. Vernon (A) 99, B) 88.

IRC 8991. **Crushed stone,** in box cars, C. L. (See Note 3), but not less than 60,000 lb., from Joliet, Ill. Rates net ton to: Waukegan, Ill., present, 55c; proposed, 61c; Chicago Heights, Ill., present, 50c; proposed, 55c.

New England

49363. Cancel commodity rates of 154c from Milford, Mass., to Breakfast Hill and Northampton, N. H., and 125c net ton to Hampton, N. H., on **quarry waste,** including rubble and grout, in bulk, in gondola or other open top cars, as published in N. Y. N. H. & H. R. R. I. C. C. F-3679, and apply class rates as per Agent Doe's I. C. C. 157 in lieu thereof. Reason—Obsolete.

49430. **Dolomite,** roasted (refractory dolomite in granular form, treated or untreated, clinkered, or burned to a dead state), min. wt. 80,000 lb., for export, from Marelan, Que., to New York, N. Y. Present—42, min. wt. 60,000 lb. Proposed—25.

49572 (2-R). **Feldspar and syenite,** crude or ground, min. wt. 60,000 lb., from Bath, Cathance and Topsham, Me., to Camden, N. J., Elmira, N. Y., Philadelphia, Penn., and Rochester, N. Y. Present—24 (per B. & M. I. C. C. A-2990). Proposed—23½. Reason—To establish rates comparable with those now in effect from other points.

STA-TRU

Long-Mesh Woven Wire Screens

made to work under tension and vibration.

The straight stay-bars carry ALL the tension. The crimps in the round wires can not be stretched or broken. The screen can not be caused to sag or split by the pull of the tensioning device.

LUDLOW-SAYLOR

WIRE CO. ST. LOUIS

Keep your conveyor belts going with FLEXCO

HD BELT FASTENERS

• **FLEXCO H D RIP PLATES** are used in repairing rips and patching conveyor belts. The wide space between outer bolts gives the fastener a long grip on the edges of the rip, while the center bolt prevents the fasteners from bulging.

• **FLEXCO H D BELT FASTENERS** make a strong, tight butt joint with long life. Recessed plates embed in belt, compress belt ends and prevent ply separation. Five sizes in steel and alloys.

• Avoid shutdowns and lengthen the life of your conveyor belts and bucket elevator belts by using Flexco HD belt fasteners and rip plates. Thousands of companies have stepped up the performance of conveyor lines and cut costs by using Flexco methods.

Bulletin F-100 shows exactly how to make tight butt joints in conveyor belts with Flexco HD Belt Fasteners. Also illustrates step by step the latest practice in repairing rips and putting in patches.

Write for your copy

FLEXIBLE STEEL LACING COMPANY
4684 Lexington St., Chicago

FLEXCO HD BELT FASTENERS
Sold by supply houses everywhere

SEVEN MATERIALS IN ONE BIN?

"You Bet—this new BLAW-KNOX plant accurately measures and loads aggregates, cement, and water into truck mixers."

Blaw-Knox Truck Mixer Loading Plants include overhead storage bins for aggregates and cement; accurate Weighing Batchers for aggregates, cement and water; arranged for manual or automatic operation; complete conveyors for handling materials from cars or trucks to bins, when desired—all properly designed and built to your requirements as an efficient unit for truck mixer loading. See Blaw-Knox Catalog No. 1582.

18

BLAW-KNOX BLAW-KNOX DIVISION • OF BLAW-KNOX CO • Farmers Bank Bldg. Pittsburgh, Pa.

TRUCK MIXER LOADING PLANTS

AMERICAN CRUSHERS

Built to make money for you!

Every part is carefully selected and tested to insure long, hard, trouble-free service. All the features which 30 years of experience have found to be necessary for all-around superior performance have been included: Heavy Cast Construction; Cast Steel Adjustable Platen; Cast Steel Discs; Heavy Alloy Steel Shaft; SKF Spherical Roller Bearings; Manganese Lined Crushing Chamber.

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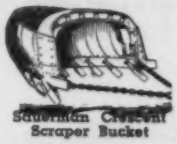
1245 MACKLIND AVE. ST. LOUIS, MO.

LOW COST STOCKPILING

Here is how one producer uses a simple setup of a Sauerman Scraper to cut cost of storing and reclaiming aggregate.



Sauerman Crescent Scraper Bucket

Sauerman Scraper handles 100,000-ton storage of crushed rock at cement mill.

JUST a few cents per ton pays for stockpiling bulk materials with a Sauerman Scraper System. Storing and reclaiming is accomplished by a single unit, operated by one man.

An exclusive feature of the Sauerman system is the Crescent scraper bucket. The streamline design of this unique bucket reduces frictional resistance in loading, conveying and dumping. Consequently, a "Crescent" will handle a given tonnage of material over a given haul in less time and with less power than required by other types of scrapers.

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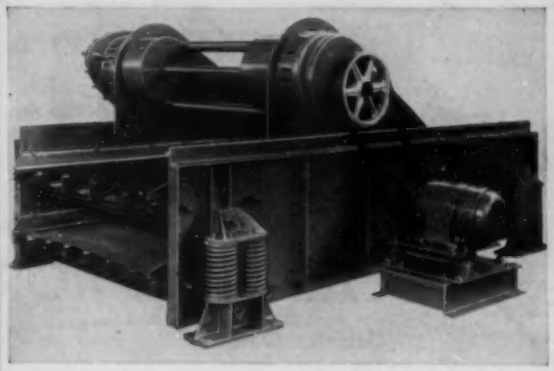
430 S. Clinton St. Chicago

SAUERMAN
LONG RANGE MACHINES



5' x 12' Double Deck Eliptex Screen

Eliptex Screen

Closer grading yet requires less area, less headroom, less power.

The unique elliptical motion of the ELIPTEX Screen assures a close sized product. The screen runs smoothly and quietly. Feeds horizontally while sizing. Available in a wide range of sizes in single and multiple deck designs. Write for particulars and prices.

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15 Park Row New York, N. Y.

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ROBINS

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New Stephens-Adamson 1-deck Positive Action Vibrating Screen. 5' x 8'—3/16" Ton-cap cloth. V-belt drive. Capacity 120 tons per hour. Been used for only 300 tons of material.

OTTAWA HYDRAULIC SILICA CORP.
OTTAWA ILLINOIS

12—50-ton Covered Hopper Cars
34—5-yd. Western 36" ga. Dump Cars
16—20-yd. Magor std. ga. Dump Cars
1—6½-yd. Bucyrus Electric Shovel
1—10" "AMSCO" Pump
2—Rotary Kilns, 8'x125'
Send for our complete machinery bulletin!

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"Anything containing IRON or STEEL"

GASOLINE LOCOMOTIVE CRANE, Orton, 12 to 15 tons capacity, 8 wheel, 40 or 50 ft. boom.
ELECTRIC SHOVEL OR CRANE, crawler type, one yd. capacity or 15 tons at 12 ft. rad.
LOCOMOTIVE CRANES, steam, 15 to 50 tons capacity.

P. A. Henault, 2140 Book Bldg., Detroit

DIESEL OIL ENGINES

All sizes and makes.
Electric Light plants.
Compressors, Contractors Eqpt.
At prices you can afford to pay.

J. D. ANDERSON MCHY. CO.
5516 Maple Ave., St. Louis, Mo.

Nos. 10 & 40 Kennedy, 7" & No. 10 Newhouse.
8A, 8B, 10B, No. 22 & 36" Telsmith.
Nos. 4 & 6 Traylor Gyratory Crushers.
9x30" Telsmith, 11x26" Champion, 14x24" Birdsboro, 15x36" Farrell, 12x30" Jeffrey, 24x72" & 60x84" Traylor, Jaw Crushers.
30x14", 40x15" & 54x24" Crushing Rolls.
18x42" Stevenson Single Roll Crusher.
16, 18, 19 & 21 ton ST 36" Ga. Locomotives.
1 Yd. Koppel—4 Yd. Western 36" ga. Dump cars.
Page 1½ Yd. Bucyrus Erie 3 & 5 yd. Diesel Electric Draglines.
90 HP Fairbanks Model 34B Diesel Engine.
110 HP Anderson "K" Diesel Engine.
Vibrating Screens—all makes and sizes.
Let us have your inquiries. Ask for Bulletin 49.

MID-CONTINENT EQUIPMENT CO.
710 Eastgate Pa. 2290 St. Louis, Mo.

41-B BUCYRUS-ERIE

Steam Shovel — 1¼ yd.
First-class condition.

J. T. WALSH
Brisbane Bldg. Buffalo, N. Y.

ELECTRICAL MACHINERY

Motors and Generators, A.C. and D.C., for sale at attractive prices. New and Rebuilt. All fully guaranteed. Write for List and Prices.

V. M. NUSSBAUM & CO.
Fort Wayne, Indiana

FOR SALE

2—Link-Belt dewatering elevators, 36' centers, complete with all steel supporting structure and drive machinery.
2—Strut bar, revolving, scalping screens, 48" diameter, 12' long, with drive machinery.
1—Sauerman, 2 cu. yd. capacity, slackline, electric hoist with 150 H.P. motor and starting equipment.

TERRE HAUTE GRAVEL COMPANY
TERRE HAUTE, INDIANA

FOR SALE

1—Standard 20 ton truck scale, 9 x 20 platform with steel, $250.00.
1—Walker Elliott Rotary Crusher for crushing 8" lumps, soft material to ½", $200.00.

G. & W. H. CORSON
Plymouth Meeting, Pa.

LIQUIDATING

Misc. Plant Equipment—Located So. Michigan
Universal gas cat. full revolving crane, 23' boom.
Barber-Greene Belt Conveyors—24" x 60'—30'—90'.
Vib. Screens—A-C 2 deck 4x8. Simplicity 3 deck 3x6.
Johnson 79 yd. cap. 2 compartment material bin.
9x20 Iowa complete portable plant, inc. power.
Haiss Loader. Log Washer, 24x20. Bucket Elevator,16x20. Jaw Crusher,7x12. Plate Feeder,etc.

JAMES WOOD
53 W. JACKSON BLVD., CHICAGO, ILL.

1—¾ yd. McMyler Gas Crawler Crane.
2—Allen Settling Tanks, 6'0" and 7'0".
1—30' Gravel Washer, 50 Ton per hour capacity.
1—3 Drum Hoist.
1—Swintek Cutter, 50'.
2—Sets Mang. Steel Sand Drags 4'0" x 17' O.C.
8"—Mang. Steel Sand Pump.

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4063 Valley View Road, Rt. 10 Cleveland, Ohio

QUARRY EQUIPMENT

Marianna, Fla. (near Dothan, Ala.)
Will sacrifice for quick sale.
240 Fairbanks-Morse diesel engine, fully equipped.
300 ton pr. hr. Williams No. 8 hammer mill.
3 track miles 56-60 lb. rails.
Nine McLanahan type knob roll crushers.
⅞ yd. Erie steam caterpillar shovel.
Two 75 H.P. A.C. motors. 220-2200 volts.
Conveyors, hoists, silent chain & sprockets, etc.

W. M. SMITH & CO.
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Consolidated begins 1940 with the purchase of a 1,000,000 bbl. Cement Plant.

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LIQUIDATION

Of the Machinery, Equipment, Buildings of

CASTALIA PORTLAND CEMENT CO.

Castalia, Ohio (2 miles from Sandusky and 50 miles west of Cleveland)

ROTARY KILNS

2—8'x125' Reeves Bros. Rotary Kilns, each equipped with ⅝" thick steel shell, triple riveted on ⅝" circumferential butt straps, double riveted longitudinal with ⅝" straps. Supporting rolls are the cradle or equalizing type with four rolls per tire; 15" face tires; 13" face girth gear. Each kiln is equipped with firing hood on wheels; one spare extra new girth gear and two rolls with shafts. In excellent condition with no bulges or other defects in shell, in the hot zone or elsewhere.

5—6'x120' Rotary Kilns, each with ½" steel plate shell, firing hood on wheels, 8" face tires, 9" girth gear, double riveted, butt strapped, single roller trunnions or two rolls per tire.

5—6'x60' Rotary Kilns; specifications same as 6'x120' kilns.

ROTARY DRYERS

3—6'x60' Direct Heat Rotary Dryers.

1—4'6"x50', Direct Heat Rotary, double shell.

1—4'x60' Rotary Dryer or Cooler, made by Bonnot Co., Canton, Ohio; ½" shell.

MACHINE SHOP

Quick Change Engine Lathes, Key Seater, Shaper, Planer, Threading Machine, Forcing Press, Drills, Emery Grinder, Hack-Saw, Milling Machine, Electric Welder, Wrenches, Reamers, Hoists, etc.

LOCOMOTIVES

4—18 ton Steam Industrial Locomotives, (3—Porter and 1—Vulcan); 36" gauge, 10"x16" cylinders, saddle tank type; each with locomotive tender, having Blakeslee jack pump.

DUMP CARS

391—1½ yd. Atlas type, two-way; 36" gauge, steel bodies.

INDUSTRIAL TRACK

7 Miles of Industrial Track; 2 miles with 60 lb. rail, 5 miles 40 lb. rail, with 27 switches and frogs.

ATTENTION: PLANT OWNERS!

THE EQUIPMENT IS SO DIVERSIFIED AS TO BE APPLICABLE TO EVERY KIND OF CHEMICAL PROCESS OR INDUSTRIAL MANUFACTURING PLANT! Prices are purposely set low to obtain quick action. We urge your immediate inspection. Representative is on premises with full authority to sell.

SPECIAL

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7-Ft. Symons Cone CRUSHER

Fitted with fine bowl.

For immediate shipment. At large savings.

BOILER PLANT

2—250 H.P. Heine Horizontal Water-Tube Boilers; 1—5'x100' high x ¼" steel stack; including boiler feed pumps, steam pumps, water purifier, etc.

LABORATORY

Tyler Rotap Testing Screen
Fairbanks Cement Tester
Electric Muffle Furnace
Analytical Balance
Disc Grinder
Miscellaneous Glassware, etc.

PUMPS

15—Centrifugal Pumps; 3", 4", 5", 6" with direct connected motors, except three with gasoline engine drive.

TRAVELING CRANE & RUNWAY

1—5 ton Harnischfeger Traveling Crane and 300 ft. long Runway. Crane is 20,000 lb. capacity, 70' span, equipped with 3—25 H.P. and 1—7½ H.P. G.E. a.c. motors. Included is a 1½ yd. bucket.

LOCOMOTIVE CRANE

1—20 ton Browning No. 8 Locomotive Crane, with 40' boom and 1¼ yd. bucket. No. 3 wheels. 40,800 lb. at 14' r.

MISCELLANEOUS

3—42" Fuller-Lehigh Pulverizers, gear driven, with direct connected 75 H.P., 3/60/440 v. 514 RPM. motors.
1—30" Ohio Electric Magnet, with motor gen. set for operating it.
1—24"x24" Jeffrey Single Roll Crusher.
1—60" Exhaust Fan, with 36"x18" wheel.
2—Car Pullers, each with direct connected 10 H.P. motors, with 150' ⅝" cable.
1—Car Puller, single drum, with 600:40 James Reducer and 10 H.P. motor.
1—Pennsylvania Hammer Mill, SXR-46, made by Pennsylvania Crusher Co., Philadelphia, Pa. Steel frame, tramp iron separator, quick adjusting cage, ball and socket self-aligning bearings, adjustable breaker plate; hopper 2'10" x 1'3" wide; 60-70 H.P., 1000 RPM; floor space 5'9" x 8'4".
2—¾ yd. Erie Type "B" Crawler Steam Shovels.

BALL AND TUBE MILLS

2—5'x22' Allis-Chalmers.
3—5'x22' Bonnot Co., Canton, Ohio.
1—5'x23' Bonnot Co., Canton, Ohio. All silex lined, equipped with CAST STEEL HEADS, steel gears and direct geared to 150 H.P., G.E., slip ring motors, 585 RPM.
6—5'x27' Tube Mills, roller mounted. Silex lined, with 200 H.P. slip ring motors, 585 RPM.
1—8'x30" Hardinge Conical Ball Mill, Titanite lined, with 175 H.P., 600 RPM. slip ring motor.
3—5'x12' Bonnot Ball Mills, cast steel heads, steel lined, with 150 H.P., 600 RPM. motors.

MISCELLANEOUS

1—12' dia. Dry Grinding Pan, Phillips & McLaren, 60"x16" mullers, steel tires.
1—Apron Pan Feeder, 36" wide x 11'6" c/c, with roller chain drive, 600:40 James reducer and 10 H.P. Lincoln motor.
2—6'x5' Tyler Hummer Screens, made up of 3'x5' screens, double deck; Nos. 1102 and 1103; type 31, with screw feeder.
1—Motor Generator Set for operating Tyler Screens.
800 Ft.—12" Screw Conveyor, steel encased, in assorted lengths of 21', 23', 25', 50', 60', 80', 104' and 106'.
44—9"x29' long Screw Conveyors, also one each 9', 22' and 32'.
3—30" Belt Conveyors; 2—24' c/c, flat with rubber belt; 1—70' c/c, flat with canvas belt.
1—36" Stedman 3-cage Disintegrator, Shop No. D-946.
1—Ingersoll-Rand Imperial type 10 Air Compressor; steam, 10" & 16"x14"; air 10x14".
7—Portable Garages, galv. steel, one car.
1—4"x8" Jaw Crusher, Sturtevant Mill Co.
1—50'x100' Steel Building, with corrugated siding and roofing, 22' to eaves.
40—Steel Lockers, Durand, 15"x15"x6'.
1—72" Volume Blower, 42"x24" wheel with direct connected 60 H.P. motor.
17—Slurry Mixing Tanks, 10' dia. x 15', 8800 gal., wood, with agitators.
2—Dust Collectors; 1—3 compartment, by Dust Recovery & Conveying Co., and 1—6 compartment Norblo, made by Northern Blower Co.—each complete with fans, shaking device, steel supports, etc.
8—Bucket Elevators, chain, steel enclosed, malleable buckets. (Full listing in circular.)

ELECTRIC MOTORS

4300 Horsepower in Electric Motors, all 3 Phase, 60 Cycles, 440 Volts. Included are 9—150 H.P. and 6—200 H.P. slip ring; 585 RPM. Shop numbers 5166879, etc.

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CONSOLIDATED PRODUCTS CO., INC.

P. O. Box 545, Sandusky, Ohio — Phone Castalia 4331

WE OWN AND OFFER FOR SALE OR RENT

AIR COMPRESSORS

Portable and stationary, belt with elec. or gas power, sizes from 20 cu. ft. to 1,900 cu. ft.

BINS

10—1—118 ton Blaw Knox; 2—85 ton Heltzel; 1—60 yd. Butler V-60; 1—72 ton Blaw Knox; 1—46 yd. Johnson offset; 1—60 ton Butler V-49; 2—35 ton Blaw Knox; 1—26 ton Heltzel with Kron dial scale. All above with or without weigh batchers.

1—Cement plant: 1—300 bbl. Johnson, portable.

BUCKETS

26—Clamshell, all sizes and types; Williams, Blaw Knox, and Owen.

6—Dragline: 1—1¾ yd. Northwest; 1—1½ yd. Omaha; 1—1¼ yd. Page; 2—1 yd. Hayward; 1—¾ yd. Page; 1—1½ yd. Pioneer Cableway Excavator bucket.

7—Dragscraper: 2—1 yd Sauerman; 1—1 yd. Green; 1—¾ yd. Garst; 2—½ yd. Garst.

CONVEYORS & ELEVATORS

4—18" Steel frame belt conveyors: 2—Barber-Greene, 60', 45' and 24'; 1—National 30'.

11—Bucket elevators: Rex and Weller, on chain or belt; all sizes.

CRANES, DRAGLINES & SHOVELS

1—Link Belt Mod. K-55 combination dragline and shovel Ser. No. 1698, gasoline power, 70' dragline boom, 2 yd. shovel front.

1—Page, Model No. 411 Diesel crawler dragline, 70' boom, 2 yd. bucket.

1—Industrial Brownhoist Mod. DC, Serial No. 5020, 50 ft. boom, 1¼ yard bucket.

1—Link-Belt K-42, combination shovel, crane and trench hoe, Serial No. 1265, 1¼ yd. shovel front, 60' crane boom.

3—Northwest, Model 105, Serial No. 1645-2053 & No. 1522 40' boom, 1 yd. bucket.

1—Link-Belt, K-1, Serial No. 1024, 50' boom, 1 yd. bucket.

2—Osgood Heavy Duty, Serial No. 2069 & No. 2087, combination 1 yd. shovel and crane, 40' boom.

2—Thew, Model "S" combination shovel crane and dragline, Serial No. 2801 & No. 2837, ¾ yd. shovel fronts, 40' crane boom.

1—P & H Model No. 206, 40' boom, ¾ yd. bucket.

1—Byers Bearcat, Serial No. 3299, 30' boom, ½ yd. bucket.

DREDGE PUMPS

1—12" Morris Heavy Duty D.C. to 100 H.P. dbl. cyl. steam engine.

3—Belt driven Morris: 1—10" Mang., 1—8", 1—6" Mang.

CRUSHERS

5—1—12"x26" Champion; 1—12"x 20" Acme; 1—10"x20" Climax No. 2½; 1—9"x16" Telsmith No. 9A; 1—8"x15" Champion.

3—Gyratory: 1 No. 5 Gates; 1 No. 3 McCully; 1 No. 0 McCully.

1—Set of Allis Chalmers, smooth type crushing rolls, 42x16".

TRACTORS AND SCRAPERS

4—13 yd. LeTourneau Type RY scrapers with Caterpillar D8 Diesel tractors, new 1938.

WHIRLEY

1—Mod. 75 Wiley Whirley No. 2973, 20 tons cap., 75' boom, 3D. Clyde 80 HP elec. hoist & 30 HP elec. swinger, all complete. Perfect condition.

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EQUIPMENT CORPORATION OF AMERICA

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Phone Nevada 2400

PITTSBURGH
P. O. Box 933
Phone Federal 2900

FOR SALE

DIESEL POWERED DREDGE

with copper bearing steel hull and cabin, fully equipped. Ready for work. Two diesel engines, one 180 H.P. and one 54 H.P. On sale through receivership. Original investment approximately $75,000.00. In first class state of repair.

If interested, write

HARRY J. LIPPMAN
910 Majestic Bldg. Detroit, Mich.

Complete

WOODFORD ELECTRIC ORE HAULAGE SYSTEM

Including ten 10-cu. yd. standard gauge side-dump cars, double-motored; all necessary electrical control equipment; Motor-Generator Set; rails, etc.

New York Trap Rock Corporation
230 Park Avenue
NEW YORK, N. Y.

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ON

RUBBER BELTING

TRANSMISSION—CONVEYOR—ELEVATOR

"V" BELTS

FOR

PUMPS—CRUSHERS—PULVERIZERS—ETC.

RUBBER HOSE

FOR

AIR—WATER—STEAM—ETC.

Partial Stock List

NEW AND HEAVY DUTY

Conveyor and Elevator Belting

Quantity	Width	Ply	Top Cover	Bottom Cover	Type
668 Ft.	36"	6	1/8"	1/16"	Conveyor
660 "	30"	6	1/8"	1/16"	"
245 "	26"	5	1/8"	1/16"	"
906 "	24"	5	1/8"	1/32"	"
298 "	24"	4	1/8"	1/16"	"
370 "	22"	8	1/16"	1/16"	Elevator
296 "	22"	8	Friction		"
1455 "	20"	5	1/8"	1/32"	Conveyor
403 "	20"	4	1/8"	1/16"	"
1738 "	18"	4	1/8"	1/32"	"
60 "	18"	8	1/4"	1/16"	Elevator
288 "	18"	6	1/8"	1/16"	"
712 "	18"	4	1/16"	1/16"	Conveyor
1096 "	16"	4	1/8"	1/32"	"
554 "	16"	4	1/16"	1/32"	"
738 "	14"	4	3/32"	1/32"	"
288 "	14"	4	1/8"	1/16"	"
110 "	12"	8	1/8"	1/16"	Elevator
226 "	10"	6	1/16"	1/16"	"

USED BELTING—Good Condition

440 Ft.	60"	8	1/8"	1/16"	Conveyor
210 "	20"	7	Friction		Elevator

We will cut any of above rolls. Advise desired lengths and widths and we will promptly quote prices. Many other sizes in stock for immediate shipment.

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62 Park Place New York, N. Y.

SPECIALIZING IN—

JAW CRUSHERS
GYRATORY CRUSHERS
CRUSHING ROLLS
SCREENS
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HARDINGE MILLS
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ROTARY DRYERS
KILNS
AIR COMPRESSORS
CRANES

Your Inquiries Solicited

BRILL Equipment Corporation
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Synch. Motor Generators

750 KW WEST., 250 V., 2400 A.C., 900 RPM
300 KW G.E., 250 V.,2300/4000 A.C., 1200 RPM
200 KW G.E., 250 V., 2300/4000 A.C., 1200 RPM
200 KW G.E.,550 V., 2300/4000 A.C., 1200 RPM
150 KW WEST., 250 V.,2300/4000 A.C.,1200 RPM
100 KW G.E., 250 V., 2300 A.C., 1200 RPM

Synch. Converters

300 KW G.E., 250 V., 1200 RPM,2300/4000 V.AC
300 KW WEST..250 V.,1200 RPM,2300/4000 V.AC
200 KW G.E.,250 V.,1200 RPM,2300/4000 V.AC
200 KW WEST..250 V.,1200 RPM,2300/4000 V.AC
200 KW R'GW'Y,250 V.,1200 RPM,2000/4000 V.AC

Each unit listed above is owned by us and is available for immediate inspection and shipment.

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Incorporated
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IMMEDIATE DELIVERY

25 & 35 ton Plymouth Gasoline Locomotives.
10x36 Gruendler Steel Frame Jaw Crusher.
¾ yd. Northwest No. 3 Gas Shovel & Dragline.
P & H 1 yd. & 1¼ Yd. Cranes and Draglines.
80, 100, 120, 180, 240 HP Fairbanks Morse and Atlas Diesels, generators if required.
2—100/150 HP Buda 6 cyl. Power Units.
1 yd. Owen type D digging clamshell bucket.
150 HP Scotch Marine type Boiler. Retubed.
All Sizes—Crushers—Shovels—Cranes—Compressors

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RAILS—1 Ton or 1000

NEW RAILS—5000 tons—All Sections—All Sizes.
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AIR COMPRESSORS
BELTED: 355, 528, 676, 1000, 1300 & 1570 Ft.
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2 Yd. OWEN Type S Material Handling.
1½ Yd., 1 Yd. & ¾ Yd. HAYWARD Class E.
48 Steel Skips 6½ x 6 x 2½.
5 Ton Bucyrus Rack Grabs.
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¾ Yd. 5 Ton O & S 50 Ft. Boom.
12 Ton NORTHWEST 50 Ft. Boom Gas.
20 Ton LIMA, 750 Diesel, 65 Ft. Boom.
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¾ Yd. Bucyrus 10B Electric & ⅞ yd. Nisley Gas.
2 Yd. Marion Steam Shovel.
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46—KOPPEL 1½ Yd. 24 & 30 In. Ga.,V Shaped.
15—2 Yd., 3 Yd., 4 Yd., 6 Yd.,12 Yd., 36 In. Ga.
20—Std. Ga. 12 Yd., 16 Yd., 20 Yd. & 30 Yd.Cap.
15—Std. Ga. 50 Ton Battleship Gondolas.
FLAT CARS
9—50 ton std. ga. heavy duty flat cars.
HOISTING ENGINES
Gas: 15, 30, 60, 100 & 125 HP.
Electric: 30, 55, 80, 100 & 150 HP.
Steam: 6¼x8, 7x10, 8¼x10, 10x12, 12x14.
DIESEL UNITS
75, 90, 180, 240 HP F. M. Engines.
110 HP Ingersoll Rand Engine.
175 KVA Worthington 3/60/2300.
275 KVA Fairbanks 3/60/2300.
BALL, ROD AND TUBE MILLS
6x8 Pebble Mill & 5x5 Batch Mill.
5'x22" HARDINGE CON. Dry Ball Mill.
6'x22" HARDINGE CONICAL Pebble Mill.
8'22" HARDINGE CONICAL Ball or Pebble Mill.
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4x16, 5x18 & 5x22 Tube Mills & 6'x22'.
3½x8 & 5x7 Air Swept Tube Mills.
2x4½, 6x12 & 5x12 ROD MILLS.
PULVERIZERS
JEFFERY 24x20 & No. 1 Sturtevant Ring Roll.
RAYMOND Auto. Pulverizer No. 0000, 0 & 3.
RAYMOND Imp Mills No. 4, 33 & 55.
GRUENDLER XXB Mill & Jay Bee No. 3 & 4.
RAYMOND 4 & 5 ROLL MILLS & 5 ft.Chaser M.
STEEL STORAGE TANKS
10,000 Gal., 15,000 Gal. & 20,000 Gal. Cap.
MATERIAL BIN
116 Ton Blaw Knox 2 Compt.
400 BARREL CEMENT BIN
400 Barrel Butler Portable Steel Cement Bin with Fuller automatic batcher, push button control.
SEPARATORS AND COLLECTORS
8, 10 and 14 ft. Separators, Gayco & Bradley.
ROLL CRUSHERS
36x60 Fairmount & 36x16 Allis Chalmers.
JAW CRUSHERS
10x8, 12x7½, 14x7, 15x9, 15x10, 16x9,16x12,16x10, 18x11, 20x8, 20x6, 20x10, 20x12, 26x12,30x15,30x13, 36x15, 36x30, 36x18, 36x14, 36x9,36x6,36x10,36x24, 42x9, 48x42, 48x36, 60x42, 84x66, 36x16, 9x36.
CONE & GYRATORY CRUSHERS
42 in. McCully Mammoth Gyratory.
5 No. 19, 25, 37 & 49 Kennedy.
18 in.,24 in.,30 in.,36 in.and 48 in.Symons Disc.
4—10 TZ Traylor 4 ft. Gyratory.
4—Nos. 5, 3 & 6 Austin Gyratory.
2—Traylor T-12 Bulldog Gyratory, also 16 inch.
8 in. Traylor T. Gyratory.
17 Gates K—Nos. 3, 4, 5, 6, 7½, 8 & 9½.
10 Inch Austin Model 105.
6, 10 & 12 Inch Superior McCullys.
SYNCHRONOUS MOTOR GENERATORS
100 K.W. RIDGWAY 3/60/2200-250-275 volt.
150 K.W. GEN. ELEC. 3/60/2200-250-275 v.
200 K.W.RIDGWAY 3/60/2200-250-275v.,900 rpm.
SLIP RING MOTORS
52 H. P. GEN ELEC. 3/60/440 v., 1200 rpm.
(3) 100 H.P.GEN.ELEC.3/60/440v.,900-1200 rpm.
CONVEYOR PARTS
BELT: 1000 Ft.60 In.,700 Ft.40 In., 600 Ft.36 In., 800 Ft.30 In.,1642 Ft.24 In.,517 Ft.20 In., 297 Ft.18 In., 500 Ft.16 In.,300 Ft.14 In.
IDLERS: 54 In.,42 In.,36 In.,30 In.,24 In.,20 In.,18 In.,16 In. & 14 In.
Head & Tail—Pulleys—Takeup for all sizes.
Steel Frames: 2,000 Ft.24 In.,30 In.& 36 In.Sections.
ROTARY DRYERS AND KILNS
36 In.x20 Ft., 3 Ft.x30 Ft., 4 Ft.x30 Ft., 54 In. x 50 Ft.,42 In.x24 Ft.,5 Ft.x30 Ft.,5 Ft.x16 Ft.,5 Ft.x60 Ft.,6 Ft.x60 Ft.,6 Ft.x20 Ft., 6 Ft.x70 Ft.,10x20,7½x100 & 8x110 Ft. Kilns.
RUBBER HOSE
Air ⅜ to 1½ in., Water ⅜ to 10 in.
STEEL DERRICKS
GUY: 8 Ton 85 Ft. Boom, 15 Ton 100 Ft. Boom, 20 Ton 115 Ft. Boom, 50 Ton 100 Ft. Boom.
STIFF LEG: 5 Ton 70 Ft. Boom, 15 Ton 100 Ft. Boom,25 Ton 100 Ft.Boom,75 Ton 135 Ft.Boom.
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GASOLINE: 3 Ton,5 Ton,8 Ton,12,14,and 20 Ton.
STEAM: 9 Ton,20 Ton,40 Ton,60 Ton & 80 Ton.
ELECTRIC: 2 Ton, 5 Ton, 8 Ton, 40 Ton.
SCREENS
VIBRATING: 2x4, 3x6, 12x8, 3x8, 3x5, 4x5, 4x8, 4x16, 48x72 & 4x12, 1, 2 & 3 Deck.
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REVOLVING: 3x12, 3x16, 3½x18, 3x24, 4x16,4x20, 4x23, 4x24, 5x20, 5x26, 6x26.

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By Owner

10 Ton Brownhoist Crane, steam, ¾ yd.....No. 6963
20 Ton Amer. Hoist & Derrick Crane, steam 1½ Yd.No.1115
7" Newhouse Crusher .....No. 8280
Scalper Screen—72" x 12'—Galland Henning.
Washing Screen—60" x 12'—Galland Henning.
6" Fairbanks Morse pump—direct conn. 50 HP motor.
10" CI pipe.
Head and tail pulley assemblies—rollers and idlers.

150 HP Motor GE 220 V. 3 ph. 600 RPM
50 HP Motor WEST 220 V. 3 ph.1120 RPM
50 HP Motor GE 220 V. 3 ph. 900 RPM
50 HP Motor GE 220 V. 3 ph. 900 RPM
30 HP Motor GE 220 V. 3 ph.1800 RPM
30 HP Motor GE 220 V. 3 ph. 720 RPM
25 HP Motor GE 220 V. 3 ph. 720 RPM
15 HP Motor GE 220 V. 3 ph.1200 RPM
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623 NORTH SECOND STREET **MILWAUKEE, WISCONSIN**

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GYRATORY: 42" McCully with 80% brand new parts. 20" Allis-C. 20" Super. McCully conv. to 16". Gates Nos. 10, 9, 8, 7½, 6, 5, 4, 3, 2, 1 (75 avail.) Telsmith Nos. 4, 5, 6, 8C, 9 & 10. Also Many Austins, Kennedys and Traylors, many sizes.
JAW TYPE: Traylor 60x34, 48x60, 42x48, 24x72, Superior 84x66 & 34x36, Buchanan 30x42, Farrel 60x42, 30x36, 24x36, 18x36, 13x24. Good Roads 1020. Acme 24x40. Misc. 7x12, 9x16, 8x20, 8x24, 12x24, 9x36, 9x30, 15x36.
REDUC. TYPE: Kennedy Nos. 25, 37 & 49. Telsmith 3-F & 40. Traylor 36" TZ, 9", 10", 12" Super. McCully 6" & 10". Newhouse 5, 7 & 10". Symons Cone & Disc Ty. 2' to 4'.
ROLLS: Allis-C. 12¼x12, 36x16, 40x15, 54x24 & 72x30. Fairmount 36x60 & Jeffrey 24x24 to 36x54 single roll. Cornish 20x14 & 42x16, Etc., Etc.
HAMMERMILLS: Williams No. 1, 2, 3, 4, 8 & 9. Jeffrey 36x18 & 26x42. Day Nos. 20 & 40, Etc.
MILLS: Kennedy Ball 4x4, 5x6 & 5x8. Marcy 8x6 & 10x9. Hardinge 6'x3', 8'x30" & 6'x9'. Misc. Tube Mills 5' & 6' x 22'. Sturtevant Ring Roll, Raymonds, Kents, Fuller-Lehigh, Etc., Etc.
CRUSHING PLANTS: No. 65 Diamond. No. 22 Pioneer 8x24. 1020 Good Roads, 9x40 Austin-Western, 9x36 C.B.

MISCELLANEOUS ITEMS

Barges, Bins, Buckets, Boilers, Cableways, Cars, Compressors, Conveyors, Cranes, Dryers, Derricks, Draglines, Drag Scrapers, Dredges, Drills, Engines, Elevators, Excavators, Generators, Hoists, Kilns, Locomotives, Loaders, Motors, Pipe, Pumps, Rail, Scales, Screens, Shacklines, Shovels, Tanks, Trucks, Tractors, Etc., in many sizes, types and makes at low prices. (I have equipment at many points in the United States and Canada. What you need may be near your plant.)

ALEXANDER T. McLEOD
7229 Rogers Avenue **CHICAGO**

CRUSHERS AND SCREENS
Jaw Crushers: 9x15, 9x16, 10x20 & 12x18.
28"x30" Geared Corrugated Crushing Rolls.
6" Traylor Bulldog "T" Gyratory Crusher.
15"x8"—A Jeffrey Swing Hammer Pulverizer.
30" Steel Enclosed Telsmith Rotary Grizzly.
3x5 1-d. Multitrap Dry or Wet Vib. Screen.
3x6 1-d. Plat-O-Vib. Screen, with Motor.
3x8 1-d. Link-Belt Vib. Screen, Belted.
4x5 1-d. Hummer Vib. Screen, V-40 Head.
2—4x8 2-d. Perfex Shaker Screens, Belted.
8—4x8 2-d. Gyrex Vib. Screens, Belted.
120—3x5 & 4x5 New Hummer Screens.
CONVEYORS AND ELEVATORS
36" Link-Belt Self-Contained Apron Feeder.
30"x100' Robins Belt Conveyor Equipment.
30"x32' L-R. Bag Conveyor, on steel frame.
24"x60' Ball-b'r'g. Trough & Return Idlers.
26" Barber-Greene Reciprocating Plate Feeder.
All Sizes of Head & Tail Pulleys In Stock.
18" Haiss Digging Bucket Loader, on wheels.
14"x30' Jeffrey Open Type Bucket Elevator.
14"x50' Cent. Bolt Inclined Elevator.
2—6"x20' Enclosed Belt Bucket Elevators.
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Air Compressors: 600', 300', 172', Belted.
2-drum Stroudsburg Builders Hoist, Gas.
50 & 60-hp. Waukesha Engines, with clutch.
No. 40 Cletrac Caterpillar Tractor, 6-cyl.
No. 44 Barber-Greene Trenchdigger, 5½'x16".
Clamshell Buckets: ⅝, 1, 1¼, 2¼-yds. cap.
12 Centrifugal Electric & Belted Pumps.
800-hp. Patterson-Kelley Feed Water Heater.
20' Span Overhead Traveling Crane, 6-tons.
Cars & Track: 11 Koppel 24"-g. 1-yd. Cars.

G. A. UNVERZAGT
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WE OFFER THE FOLLOWING STANDARD GAUGE SADDLE TANK

LOCOMOTIVES

at Very Attractive Prices
ALL THOROUGHLY RECONDITIONED

3—14x22 American 40 Ton
1—15x22 Porter 40 Ton
1—14x20 Porter 38 Ton
1—14x20 Vulcan 38 Ton
1—13x18 Porter 32 Ton
1—12x18 American 25 Ton

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New—RAILS—Relaying

ALL SECTIONS

Also contractors' equipment, "V" shaped and Western cars, 24 and 36-in. gauge, portable track, gas locos, frogs and switches. Attractive prices quoted. Wire, write or telephone for quotations.

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Partial Equipment List

C. S. Johnson 5 compt. bin 1000 c.y. automatic batchers.
1—Bin 3 compt. 140 ton Johnson, weighing scales.
15—Compressors 528'-2600' cap. Gas, Diesel, Electric drives, Stationary & Portable.
21—Boilers—20 to 150 H.P. Vertical & Horizontal —High Pressure.
60—Hoists: 1-2-3 drums,—steam, gas & electric.
5—Derricks—Steel Stiff Leg, 10-25 T. cap.
15—Locomotives, 8-40 T. Gas, Steam, all gauges.
20—Flat cars—36" gauge, 4 T. roller bearing.

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Rail and Rail Supplies

Coast to Coast Equipment Corp.

9 Rockefeller Plaza **New York, N. Y.**

FOR SALE

USED EQUIPMENT

10 x 20 DIAMOND Roller Bearing Jaw Crusher.
10 x 36 DIAMOND Roller Bearing Jaw Crusher.
15 x 36 DIAMOND Roller Bearing Jaw Crusher.
2'0" x 4'0" single deck DIAMOND vibrating screen.
6 to 8 HP model MRP3 LeRoi Engine.
Model No. U-40 Allis-Chalmers Engine.
4" Sterling Sand Pump No. 3558.
60" x 20'0" Revolving screen—Structural frame on wheels.

NEW EQUIPMENT

1—DIAMOND 9 x 16 Bronze Bearing Jaw Crusher mounted on truck with 15-20 HP engine.
3'0" x 8'0" Triple deck Diamond Vibrating Screen.
21-Cu. yard Jack Leg Bin.
Special Price for quick sale.

Diamond Iron Works, Inc., and Mahr Manufacturing Company Div.

MINNEAPOLIS, MINN.

Used Equipment For Sale

Butler concrete batching plant, 5 compts., 105 yds. aggregate, 200 bbl. cement, weighing devices, etc.
225 bbl. Erie bulk cement plant, complete.
155 bbl. Fuller cement bin, electric batcher.
Blaw Knox 270 bbls. bulk cement plant, complete.
72 ton Blaw Knox steel bin, portable, 2 compts.
50 ton Blaw Knox steel bin, portable, 2 compts.
42 cu. yds. Beaumont steel bin, 2 compts.
Pumperete machines, Model 180, 190 & 200.
Fuller Kinyon bulk cement unloader, portable.
Fuller C40 rotary air compressor, electric.
Gyratory crushers: K.V.S. 20, 57-S, 49; Telsmith 52, 8A, 8B; Traylor 8"; McCully 12", 8", 6".
Jaw: 6x12, 9x16, 10x20, 12x26, 13x30, 15x30, 16x32, 36x48, 48x60.
Jeffrey Type A 20" x 24" pulverizer.
Apron feeders, 18"x6', 24"x6', 48"x14', 5'x15'.
Bucket elevator, 32' chain, buckets 8"x6"x12".
Revolving screens, 72"x30', 72"x18', 60"x24'.
Robbins, 6x8 double deck Gyrex vib. screen.
Telsmith 4'x10' single deck vibrating screen.
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Universal 7½ ton truck crane, Mack truck.
Lorain 40 truck crane, 9½ tons, 45' bm. Mack
Blaw Knox single line clamshell bucket, ¾ yd.
Hales clamshell bucket, 1¼ yd. rehandling.
Barber Greene conveyor, 24"x70'.
8 Barber Greene conveyers, 24"x25', type N.
Barber Greene conveyor, 18"x60'.
4 I. R. Wagon drills, FM-2, pneumatic tires.
Complete stone washing plant. Write for details.
I. R. Model 50 Leyner drill sharpener.
Gas locomotives, 2½ to 25 tons.
8—Koppel 2 yd. 20" ga. steel V dump cars.
Dredge pumps, 6", 8", 10", 12", 16".
8"x8" cent. Lawrence pump, portable, 35HP., gas.
8"x6" cent. Barnes pump, portable, 35 HP., gas.
6"x5" Lawrence pump, 20 HP., electric.
4"x4" cent. LaBour self priming pump, 15 HP.
Ing. Rand XCB-2 676 cu. ft. air compressor.
Sullivan WJ-3 850 cu. ft. air compressor.
Ing. Rand 315-A Diesel air compressor, portable.
Sullivan WK60 315 cu. ft. portable air compressor.
DeWalt Woodworker, 16" circular saw, electric.
Wodack "D" portable hand saw, circular, electric.
Stiff leg derrick, steel, 30 tons, 97' boom.
Steam hoist, 10"x12", 3 drums, Lidgerwood.
Clyde 3 drum electric hoist and swinger, 75 HP.
Lidgerwood, 2 drums, swinger, gas hoist, 75 HP.
Sauerman 4 yd. dragline hoist, 150 HP, electric.
Sauerman two drum dragline hoist, 75 HP, gas.

RICHARD P. WALSH
30 Church Street, New York, N. Y.

LOCOMOTIVES — 2 — 55-ton, steam, standard gauge, power reverse, air operated fire doors. Nat. Board Boilers, 200 lbs. pressure, air brakes, tractive effort 27,800 lbs., built 1933, used ten months.
1—45-ton, steam, 36" gauge, air brakes, Nat. Board Boiler, 200 lbs. working pressure, 22,500 lbs. tractive effort, built 1922, used eleven months.
1—14-ton, Gas, 36" gauge.
2—Ten ton, 36" gauge.
1—Eight ton, 36" gauge.
DIESEL ENGINES—1—450 H.P., vertical, 4 cylinder, solid injection, 225 R.P.M., with or without 300 KW, 3 phase, 60 cycle, 2200 volt, Generator.
1—175 H.P., six cylinder, 950 R.P.M., with radiator, fan, clutch, outboard bearing, etc.
1—120 H.P.
1—40 H.P.
HAMMER MILL—1—Jeffrey, Type B, 36 x 24.
RING ROLL MILL—Sturtevant Number 1 and Number 2.
COMPRESSORS—Ingersoll-Rand, portable, gas, all steel wheels, capacity 330 ft.
DRY PAN—1—6', new condition.
DRYERS—78" x 30', 72" x 60', 96" x 86'.
JAW CRUSHERS—1—10 x 20. 2—48 x 60.
GYRATORY CRUSHERS—all sizes and types.

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LANSDOWNE THEATRE BLDG.
LANSDOWNE, PA.
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FOR SALE

1—4'-0" x 30'-0"
Rotary Dryer

McDERMOTT BROS. CO.
Allentown, Pennsylvania

2—Sturtevant Vertical Engines, Type V 57, Size 9 x 9, 250 RPM, Steam pressure 150.
8—Sturtevant Engines, Type V 57, Size 6 x 7, 400 RPM, Steam pressure 100.
2—Roots Rotary Pumps, belt driven, Size No. 1, Cap. 20,000 GPH at 165 RPM, Head on discharge 55 ft.
2—Roots Rotary Pumps, direct connected to Sturtevant Vertical Engines, Type V 57, Size 7 x 7, Steam pressure 150, 200 RPM, Cap. 30,000 GPH at 200 RPM.

Standard Equipment & Salvage Co.
2501 First Avenue, North
BIRMINGHAM, ALABAMA

DRYERS

1—Slightly Used Monel Lined Dryer; 5/16" Tank Steel; Lined with No. 16 Full Finish Monel Sheets.
1—Used Hersey Dryer: 6'x30' Metallized Inside with .015 Aluminum Sheet.

For Full Particulars write

JEFFERSON ISLAND SALT MINING CO.
Jefferson Island, La.

Used Equipment Wanted

WANTED:

Power stripper block machine with pallets. Must be in good condition. Give full particulars. **Box 937, care of Rock Products, 309 West Jackson Blvd., Chicago, Ill.**

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5 Million yards Sand & Gravel deposit. A1 quality tested. Electric power, water, R.R. switch, highway right at deposit, 3 miles to city of 100,000 pop. Several million dollars worth project soon to start.
Will lease on royalty basis to financially responsible party.

WM. CHRISTIE, OWNER
KIRKWOOD, BROOME CO. NEW YORK

FOR SALE
Up to 5000 Acres of Tennessee
PHOSPHATE LANDS
Mineral Rights or Fee Simple
BEST AND SAFEST PLACE TO INVEST IDLE MONEY
H. D. Ruhm Columbia, Tenn.

Positions Wanted

POSITION WANTED — SALESMAN OR SALES ENGINEER — Portland Cement or Contractors equipment or allied products. Territory: Pennsylvania or New York States, preferred. Technical qualifications. Proven Sales record. Excellent references. Large following with contractors, dealers, architects and engineers. Address Box 934, Care of Rock Products, 309 West Jackson Boulevard, Chicago, Ill.

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POSITION WANTED — PLANT MANager, with a thorough knowledge of lime burning, shaft kilns, fine grinding, hydration, open and mine quarries, cost and maintenance, experience with all kinds of fuel. Have produced agricultural, chemical, and building lime. Twenty (20) years' experience. Address Box 935, Care of Rock Products, 309 West Jackson Blvd., Chicago, Illinois.

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YOUNG COLLEGE TRAINED MINING Engineer, several years' underground mining experience, for position in the southeast. Give full details concerning qualifications, experience, salary expected, recent photograph. Address Box 936, Care of Rock Products, 309 West Jackson Blvd., Chicago, Illinois.

Consulting Engineers

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CONSULTING ENGINEER
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WE LOOK INTO THE EARTH
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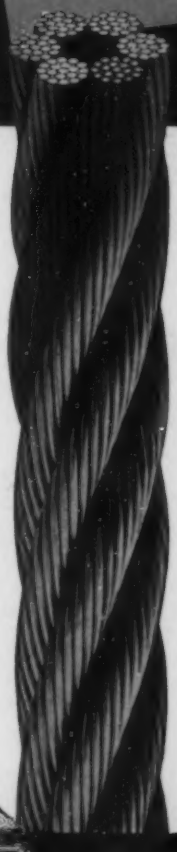

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